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OCTOBER 1944

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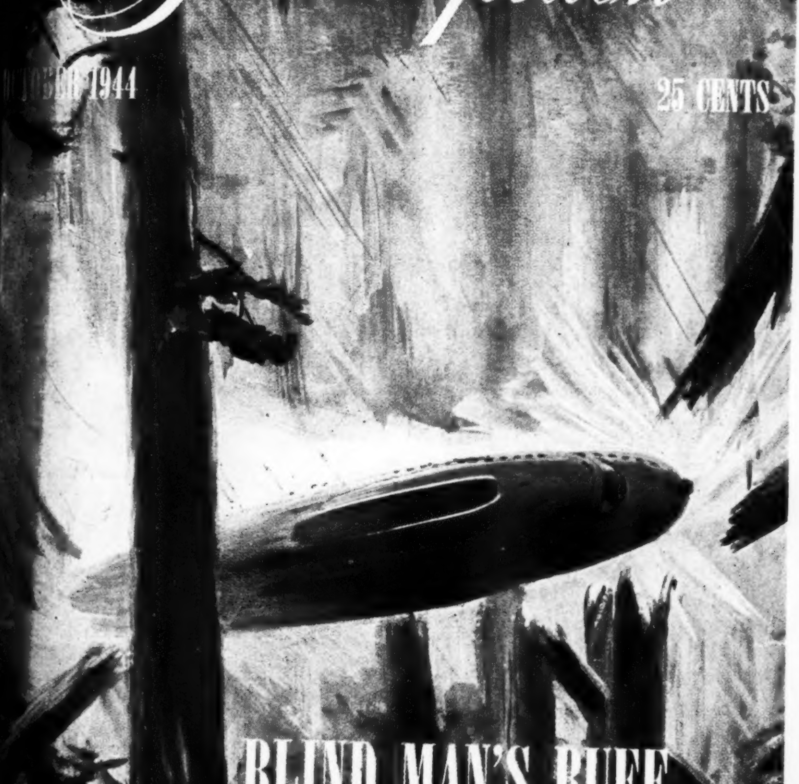
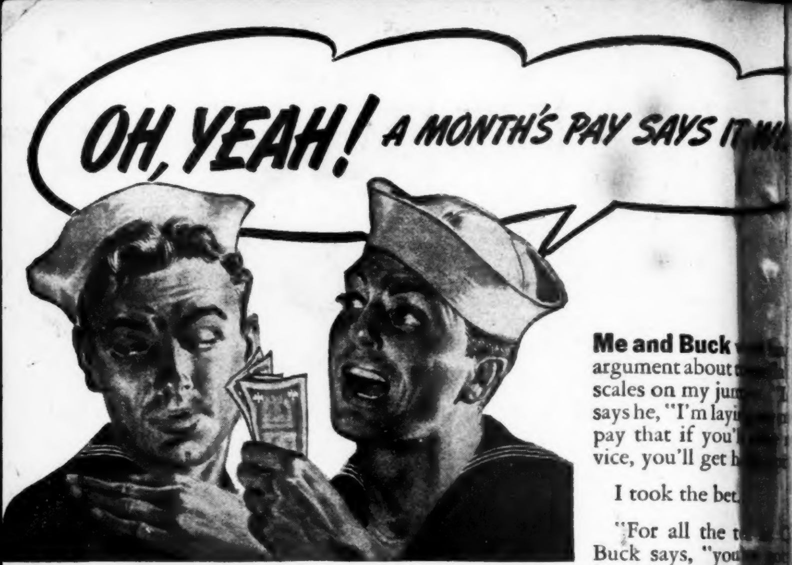


BLIND MAN'S BUFF

BY MALCOLM JAMESON



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argument about t
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says he, "I'm layi
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I took the bet.

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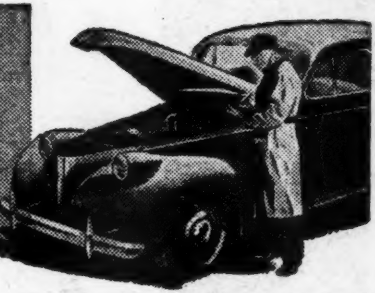

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Editor
JOHN W. CAMPBELL, JR.

ASTOUNDING SCIENCE FICTION

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Inventions Wanted

According to Edison, genius is ninety percent perspiration, and ten percent inspiration. That appears to have been perfectly true of Edison's own, personal method of operation. I've heard he tried fifty thousand different substances before he found a type of carbon filament that would stand up well enough to make the incandescent light practicable. (By the way, it's a misunderstanding to say Edison invented the incandescent lamp; there'd been several dozen types invented and marketed before Edison. Edison finally figured out one that worked, when made by commercially practicable methods.)

But that, while a neat turn of phrase, is not quite fair. That "perspiration" implies hard, drudging work—the Horatio Alger formula. My personal observation seems to indicate that a top-rank research scientist is a man who never has, and never will do any work—not for pay, that is; he may still have to mow the lawn and dig the victory garden. George O. Smith claimed that the Garret Genius, the Yankee Inventor, was a vanishing yankee. Hm-m-m—but he just vanished into a laboratory where he went right on playing at his pet hobby, but had somebody else to foot the bills. The somebody else—usually a corporation of considerable size—was delighted to do so. The researcher—when he does it professionally, his title is changed, even if nothing else is—is delighted; he can play the same ever-fascinating game, with much better equipment, for unlimited hours, and not worry about the expense. Sure, the ninety percent tries-that-don't-work and ten percent tries-that-hit-the-jackpot is apt to show up—only more on a 99.9% to 0.1% basis, actually. But it isn't real, drudgery—work. It's worth millions to the corporation, perhaps, and hundreds of millions to the world. And it's just a hobby, satisfying, at least in part, the insatiable curiosity of the researcher at somebody else's expense.

That at least seems to be the American laboratory way. It tends to make an American research scientist a rather loose-limbed, free-roving sort of intellectual—any tricky little problem vaguely in his field is a challenge—and grist to his mental mill. The man whose business is designing coin-in-the-slot merchandising machines will undoubtedly do a lot of unserious—but highly efficient—thinking about how to befuddle his latest model into giving something for nothing.

That same man is apt to be engaged now in figuring out the intricate mechanisms of a fuse-timer, a bombsight, or perhaps automatic destructive devices to ruin a secret device if it's tampered with. Automatic pencil engineers did a fine job of simplifying and improving antiaircraft fuses.

And several devices that I have long known to be possible in theory, but impossible in fact because no apparatus could be built to meet the mutually exclusive requirements, are in quantity production, to the acute discomfiture of Nazi and Nip warlords, and to the sudden demise of Nazi and Nip warriors.

One of the problems of our present war effort is to bring to the attention of free-roaming, inventive minds the items that are crying for answers. A telephone engineer came up with the prize fire control system, though telephone communication and heavy ordnance seem rather unrelated.

The Office of Scientific Research and Development is trying to get the right problem to the right men—but it's impossible to guess, sometimes, where the right man may be. Some of the still unsolved problems, or still incompletely solved problems, of the war effort follow. The National Inventors Council, at Washington, would be most interested in suggested solutions—and has a lot more problems they'd like to have solved.

1. Something that could be applied to glass to eliminate glare—but something durable that could be applied in the field. There are two antiglare systems now, one moderately durable, but extremely tricky in application.
2. Methods of protecting our vehicles from enemy landmines. Anybody figured out science-fiction's pet explosive-detonator ray, even if it will work only twenty to fifty feet? Most of science-fiction, it seems, has gone to war; that one is about due.
3. Noiseless hand-pumped generator-flashlight. Flashlights are mighty handy, but batteries are mighty hard to get. The light should be continuously brilliant, and start on the first pump.
4. For field use, a simple, practical and accurate method of determining moisture content of aviator's breathing oxygen. That, incidentally, will be much appreciated by the Air Forces; even minute traces of moisture can kill pilots by forming ice-plugs in the oxygen lines. In the stratosophere, at 60° or so below freezing, minute water vapor content will freeze out—and always in the most deadly places.
5. Clothing giving protection against falling pieces of white phosphorous. White phosphorous is used to generate smoke screens—it produces the most impenetrable fog attainable. It also is very useful in inducing enemy personnel to remove themselves rapidly from machine-gun nests, pillboxes, and the like; a tiny piece of WP on the flesh produces a nasty cross between a third degree burn and a running ulcer.
6. Methods of generating an artificial fog that will stay put.
7. Methods of dispersing an artificial—or natural—fog that seems to want to stay put.

Blind Man's Buff

by MALCOLM JAMESON

The Commission had a fine-sounding offer—just show 'em how much of Venus you wanted and it was yours. Trouble was, you had to make a map of the unmappable!

Illustrated by Kramer

The bright dot had grown to a disk days before, now it was a dazzling silvery sphere, looming straight ahead. Lorimer, the assistant umpire, sat in the radio booth dozing, his headphone strapped on. Hartley made a few last adjustments to his adored Maggy—the instrument with the X-ray eye—and then walked over to where Travis sat staring into the visiscreen.

"The big money sure ganged up on us," remarked Hartley, surveying the outside scene as reflected before them.

"They've got numbers, if that is what you mean," said Travis, with a grim chuckle, "but I'm not so sure about the brains. The Farrington-Driscoll combine always did do their dirty work statistically. They're doing it now. Most of those poor devils you see out there won't be alive this time tomorrow. Driscoll's game is as simple as the Rule of Three. The mortality of ships trying to land on Venus is roughly a hundred to one. Ergo! He sends a hundred and some odd ships. His competitors—like you and me and old Buck Turner—are playing singletons. All of us combined, if we were combined—which we are not—haven't a ghost of a show along with his bird dogs."

"Unless we're smarter," amended Hartley.

"Yes," grunted Travis.

Other ships were to the right and left of them, abreast but curving downward in a great circle that closed forty miles below their keel. The formation centered on the lone cruiser that carried the chief umpire and which followed the base course between the Earth and the planet of their destination. Shortly they would arrive at the point ten diameters distant from Venus, and that was where the take-off would be. After that it would be a free-for-all scramble for the honor—and untold riches—of being the first man down.

Most of the ships carried the yellow-and-blue markings of the newly formed Venusian Land Development Co., the Farrington-Driscoll enterprise. Buck Turner's rusty old tub floated somewhere on the far side of the circle. Nearby were two crazily converted yachts manned by adventure-struck college kids. A quadrant away there were several other independent entries, all of an impractical nature. One was a man who fondly held the theory that the only way to tear away the deadly veil of Venus was to take actual soundings with wire drags and then drop kite balloons with moorings. His idea was to plant buoys, so to speak, to mark the more dangerous crags. Another was a fellow who claimed to be an expert meteorologist, and whose ship was fitted with bins containing colored flours. By dumping those on the Venusian cirrus he hoped to make stains whose motions he could study. By charting the general circulation of the upper air and noting the presence of updrafts and eddies, he hoped to deduce the locations of the hazards below.

Travis and Hartley's own hope was pinned on magnar—the Maggy, as they preferred to call it—a squat machine that embodied all the virtues of super-radar plus, but inverted. Where old-style radio used oscillating electric currents to generate magnetic waves, magnar operated on reverse principles. Surges of magnetrons set up electric strains which reacted from the surroundings. The results were incomparably more satisfactory than with standard electronic equipment since it was penetrative and analytic as well. But marvelous as the instrument was in its tests under terrestrial conditions, its behavior on Venus was yet to be ascertained. Curious magnetic phenomena had been observed there, due probably to the proximity to the fierce radiation of the sun. Auroras were encountered at all latitudes, and there was known to be a low belt practically opaque to all but long waves. But for better or for worse, they intended to depend on their device to get them safely down, and for the later complying with the strict rules laid down by the Bureau of Genomics in the staking out of their claim.

A gong struck warningly, and Lorimer came to life.

"It's the standby signal," he said, and cut in the loudspeaker.

"All ships, attention," boomed the voice of the chief umpire. "In five minutes we will arrive at the take-off point. See that you are not ahead of the station or you will be disqualified. Everyone listen carefully while I refresh you on the rules. Ships will go in with open mikes, so that I can keep track of your whereabouts. Upon making your planetfall you are to ground your ship where it may be, leaving the assistant umpire on board for communication purposes. Set up a radio beacon at once so that if necessary I can visit you to check up. After that you are free to explore the territory about you."

There was a pause for acknowledgments up to that point. Travis nodded. He knew the rules. The signals came through loud and clear. Violent earthquakes and torrents of boiling volcanic mud falling as rain drove him away shortly after he landed, but the beacon he left behind served long enough to allow him to regain the stratosphere safely. It ceased sending within the hour, indicating that subsequent earthquakes had destroyed it, but it showed what was possible.

"After your reconnaissance," went on the voice from the cruiser, "you should then stake out your claims. Vague descriptions, wooden stakes, blazes on trees, or loosely piled stone cairns will not do. There was too much litigation arising from the careless early surveying of Mars. Good topographic maps must be submitted, tracts described by metes and bounds, and the corners tied to salient landmarks. If possible, the survey should be tied to the planetary grid. In cases of conflict, title will be awarded to the most accurately mapped claim."

"Imagine that!" sniffed Hartley. "Expecting good topography in a dense fog. It's a good thing we have the Maggy."

Travis was silent. He was wondering how those clauses happened to be in the conditions. Could it be that Driscoll had a hand in it, knowing their meaninglessness but having devised some way to beat the game? For the term planetary grid implied either a previous triangulation survey or the establishment of circles of latitude and longitude, a manifest impossibility in view of the record. Perhaps Driscoll meant to perform such a survey. He had an army of men, and was known to have taken aboard a great quantity of infrared equipment. Given time and men enough, Venus could be triangulated, using heat detectors and directional walkie-talkies. It was a disturbing thought.

"Ten seconds to go," warned the cruiser, after which came the long buzz.

"Hop to it, and good luck," were the umpire's final words.

The screen was no longer jet-black with the bright silver ball in its center. It was half-and-half silver and black, the velvety star-spangled sky covering the upper part, and the dazzling shell of Venus the lower. The dividing line had been a strongly curving arc—a segment of the upper limb of the planet. But it had flattened little by little until it showed no curvature. It was a straight line—a horizon. What lay below appeared to be an endless, featureless field of snowy white, flat as a floor. It looked like snow, but it was not. It was an expanse of spicules of ice, the frozen upper cirrus that marked the boundary between the stratosphere and the zone of cloud and fog. Travis shifted the controls. He took the ship off its tangent and put it into gently curving "level" flight. The altimeter stood steady now. Its reading was twelve kilometers.

They had not hurried. At the signal "GO" some of Driscoll's bird dogs had, as well as the enthusiasts among the other entrants. All wanted to be the first in, as the bursts of violent fire from their reserve tubes showed. But as they fanned out, each toward the assigned section of the Venusian perimeter, Travis hung back. There was no rush. Most of the early birds would die, if history was any guide, and he did not choose to be among them. He saw that Driscoll cagily hung back too, and the strategy of it was plain. The foxy financier would wait to see which of his scouts survived, then follow in on his beam. If none survived—well, he could write the expedition off and go home again. There would always be another time.

"What do you hear?" snapped Travis, addressing Lorimer, who cringed in the radio booth listening through headphones to the other ships. The man's face was white and his eyes large and glazed, and at times he shuddered violently.

"I . . . it is a shambles down there," he said, licking his lips. "They're crashing right and left. You hear 'em reporting, then all of a sudden there's a scream . . . something about a pinnacle looming up in the mist . . . or else no sound but a burst of static . . . oh, sir, don't you think we'd better turn back?"

"We're not as crazy as we look," said Travis grimly. "But we're not turning tail yet."

He made other adjustments to the ship. Much of the momentum had been braked down by air resistance. Now only one tube was jetting, and that at just a trickle to maintain steerageway. Travis pulled the levers that extruded the vessel's stubby wings and stabilizer fins. From here in the ship would have to be handled as a glider, but with ample reserve power at the throttle.

"Warm up the Maggy," he said, "and start shooting."

Hartley turned on the magnetoscope. That was an attachment that converted distances and bearings into light rays. Magnetronic tubes did the trick, throwing the resultant visual image onto a concave screen on the far side of the compartment. For a moment the screen showed nothing but haze, but as fog dissolves and pictures emerge from behind it, the haze melted. What was revealed was truly amazing.

The layer of frozen cirrus vanished. Several miles below its level there suddenly appeared what seemed to be an azure sea sprinkled with scattered rocky islets, arranged in long, twisting chains. But it was like no ocean man had ever looked upon. Its surface appeared hard and glistening, as if of ice, but that illusion of rigidity rose and fell in mighty pulses, now covering, again revealing more of the rough crags that jutted through it. There was a miragelike quality about the whole scene, for nowhere on any of the islets show shores or beaches, though their jagged outlines expanded and contracted in phase with the heave of the strange crystalline sea.

"That must be your ionosphere," ventured Travis, squinting at the astonishing vista. "That is the phenomenon that distorts radio beams, though it seems to stop ours cold. But at least we are able to define it sharply. That is some help."

"Go down as close as you can and see what it does," suggested Hartley. "Maybe the angle of incidence has something to do with it. Maybe it will recede or vanish."

"Right-o," said Travis, and nosed the ship over into a dive.

Inexorably the gleaming surface seemed to rise up to meet them. It did not give an iota, or fade. It was an absolute thing. The magnetoscope version may have been pure illusion, but what met their eyes appeared hard and unyielding. If Travis maintained his angle of dive, it could be but a matter of minutes until the ship would be put to the acid test. It would either crash against reality or else plunge through—*what?*

"Stop! Don't go on down. Please don't!" wailed Lorimer. Unnoticed he had stolen over and was staring wildly at the screen. "It's suicide, I tell you."

Travis eased off on the controls and halfway flattened out.

"What do you mean?" he asked, roughly.

Lorimer was thoroughly frightened. Trembling and whimpering he blurted out what he had been overhearing on the intership. Most of the other entrants were gone—all the independents and scores of Driscoll's ships. Many shattered themselves against hidden crags, a few reported themselves stuck in morasses that were about to engulf them. A number of the Driscoll vessels had mutinied and turned tail. Only one was down safely, and he was complaining to Driscoll and the umpire of his plight. He was being tossed about on a turbulent ocean and shipping water with every giant wave, for his altimeter had been at fault and he cracked his plates on striking. Venus was living up to her deadly reputation.

Lorimer never finished his piteous narration. He caught another glimpse of the pseudo-sea over Travis' shoulder. It was now but a matter of yards away and impact was at hand. Lorimer uttered a little moan and keeled over in a dead faint. Travis shot the slumped figure a contemptuous glance and flicked a lever.

"Shall I try the chute stunt?" asked Hartley, cheerfully, as Travis pulled the ship into a saving climb.

Travis shook his head.

"Too risky. I had rather we stick together. What about supersonic frequencies. Can you tune the Maggy to those? I doubt if anyone ever thought of using them for soundings."

"I can try," said Hartley, and proceeded to alter the magnostat setting. He was not sorry to hear the parachute alternative was out, since it had been a forlorn hope at best. One of them was to jump overboard with the automatic beacon, trusting to luck that he fell near a place where the ship could land. If radio failed there was still hope of sending up messages tied to soundage ballonets. But snaring those, or even seeing them in the upper air would be a tough task for a fast-moving vessel.

The sonic soundings did work. The Maggy was not geared to convert that data to vision, but Hartley could interpret the echoes.

"That string of islands to the right," he said, "terminates in a sheer cliff. What I get from beyond it is very faint and much delayed. I think the precipice is a high escarpment or else the near wall of an immensely wide canyon. Try it there."

"Here goes," said Travis, grimly, and started the hazardous plunge.

The passing through the mysterious ionosphere was an impressive moment. They winced in spite of themselves at what looked like imminent deadly impact. Then the magnetoscope faded into a blur of milky blue, matching the formless haze of swirling mists that still showed on the standard visiscreen. The terrible uncertainty lasted for a second, and then the picture cleared again, this time with the strangely oscillating azure surface vaulting close overhead. Stretched out below them was a magnificent vista—incredibly weird, but as open to their gaze as any bird's-eye view ever obtained on Earth. Magnar had pierced the veil of the promised land. Venus was theirs!

The terrain was a magnificent jumble of Earth forms. The sierra that formed the crenellated top of the escarpment was lost above the ionosphere, but all else was there for the seeing. Steep talus slopes at the foot of the mighty cliff led down to what on a normal planet would have been a plain. But this plain was broken by scores of volcanic cones, many of which were shrouded in a curious pall of dirty brown — probably volcanic ash turned to falling mud by the ever present moisture. Elsewhere there were badly tilted plateaus and solitary mesas, between which meandered great rivers. Far away and to the right lay the sea. It was a real sea this time, and dappled with islands, great and small, many surrounded by reef-inclosed lagoons. The borderline between the sea and land was a vague marshy area where the rivers lost their identity in a maze of tortuous bayous, deltas and lagoons. Over all, wherever the ground was fairly level, there were vast forests of incredibly high trees.

Travis cruised along with his eye peeled for the best place to land, for once they were down they would have to leave the ship and proceed as best they might in the amphibious crawler in the hold. Suddenly he caught sight of a curious arrangement of naked stones near the crest of one of the tilted plateaus.

"That's a funny outcropping," he began, "it looks for all the world like—"

The rest of the sentence died on his lips, for Lorimer came suddenly to life. The man was crazed with fear. He dashed across the room, screaming in hysterical frenzy.

"I won't let myself be murdered," he howled. "You are *not* going through with this madness!"

Travis and Hartley hurled themselves at him, but Hartley's flying tackle and Travis' vicious uppercut landed too late. The damage was done. Lorimer slumped back into unconsciousness, but it was by the eerie light reflected from the still glowing visiscreen. Everything else was dark. The magnetoscope was dead. Lorimer's wildly clawing hands had managed to yank half the switches on the panel open. The emergency lights slowly blinked on, but meter pointers still oscillated wildly, especially those having to do with the magnetic circuits. The abrupt interruption of the current had set up magnetronic eddies that would not die down for minutes.

"Get the supersonics going again if you can," said Travis between his teeth, "but it looks as if I'll have to land this baby blind."

He cursed fervently, trying to recall all the varied detail of the topography he had been studying. But there was no time for reasoned action. The altimeter reading stood at a bare kilometer, and was dropping fast. Before he could get the vessel under control it lurched heavily to the crackle of snapping branches and the scraping of treetops along the underside of the hull. The lurch turned into a bucking forward fall punctuated by many jolts and bumps. For a moment the ship seemed to tear itself clear, but only to go into free fall. There was the briefest sickening instant of thudding impact, and their voyage was ended. With a squishy thud and a lazy roll, the ship came to rest. Travis and Hartley sat up in the respective corners into which they had been pitched and listened. To their ears came the steady lapping of water alongside their keel and the patter of raindrops on the roof.

"So this is Venus!" said Hartley, wryly.

"Uh-huh," grunted Travis, hauling himself to his feet. "So it seems. Better get the beacon set up. I'll take stock."

"Dismal place," was Hartley's comment. He was gluey mud to his midriff, having just climbed back into the entry port. Back of him was a curtain of hot rain that splashed to the ground only to rise instantly in clouds of steamy vapor. Dimly seen below was the crawler, itself mired to the hubs of the half-track rotors. Gurgling rivulets of water ran past it toward a larger stream they could hear roaring in the background. Vision stopped five yards away. Beyond that was only uncanny yellowish light, of equally mild intensity in every direction. Sogginess, and a dispiriting sort of amber semi-light was the keynote of Venus.

"What's the lay?" asked Travis. A distinctly chastened Lorimer peered over his shoulder.

"Trees, mostly. Unbelievable trees," said Hartley. "The California redwoods would be saplings here. If it's organics they want, we've got 'em. Shade doesn't seem to mean anything here with the light evenly diffused the way it is, because between the big trees there are all sorts of others, some with fruits like melons. And underneath everything is giant brush. Gosh. The going is plenty tough. I'm glad we don't have to survey this planet inch by inch."

"We'd better get going with the Maggy, then," said Travis. "Lorimer helped me set it up. All we need now is the pantos and your expert assistance."

Hartley washed the worst of the mud off him and then followed Travis up the ladder that led to the dome hatch. The instrument rested on the flatter part of the roof, shielded from the downpour by a hastily stretched tarpaulin. By it stood the box that was to receive the scale relief map the Maggy was to construct. It was a three-sided, open-topped affair, made of plates of transparent synthetic crystal. Travis fastened the pantograph's arms to lugs extending out of the magnar's side, and attached the quills at their tips. When he finished the rigging, the pantos extended out into the receiving box.

"We'd be sunk without our Maggy," said Travis, gazing at the veil of water that poured down on all sides. "Driscoll's men brought along a flock of infrared equipment and bolometers, but even with those they will find surveying this country a tough job. What the—"

The ship groaned and trembled beneath them, and they were shaken until their teeth rattled. They had to cling at the swaying stanchions to keep from being tossed off the ship. But the earthquake, though severe, did not last long. It died out in a series of shuddering tremors and then there was quiet again—the watery quiet of splashing rain and gurgling ravines.

"Log the time of that," Travis called down the hatch to Lorimer.

"Ready to ride," announced

Hartley, promptly putting the earthquake out of his mind and going back to the machine. "Let's make this first try accurate. They'll be more likely to accept the later abbreviated ones if we show them all our paces. I'll start with the underlying igneous rocks and fill in above as I go. Use black for that."

Travis filled the panto quills with a tarry substance that when exuded hardened quickly into a dark glass. That was the symbol that stood for granite in their code. He had other plastics for the other rocks—dark red for sandstone, olive green for shale, a dirty yellow for limestone, and so on. Hartley cut in the juice.

It took the Maggy an hour to lay the foundation for their work. The weaving pantos worked in and out in an ever widening arc as directed by the operator, squirting the colored plastics onto those laid before. Where volcanic necks intervened—and there were many—Hartley stepped up the current so as to force the reluctant radiation through, since when it was set to be reflected by basalt it would bounce back from the nearer surface. It took skill and understanding, but in the end they were well pleased with the result.

What stood in their box was the skeleton of what was to be a diorama of their surroundings—so far just the naked land on which they rested. One could walk around the crystal box and see just how far down the basic magma lay, and how the stratified rocks above were twisted, folded, and faulted. It was the geologist's dream come true. If they had been interested in ores, they would have had only to adjust the radiation to the proper setting and delineated it neatly in any special color they chose. As it was, in case of challenge, a simple drill rig could verify their claim in a short time.

Hartley stopped long enough to have a smoke, though the sodden tobacco did not draw well. Then he changed his tuning slightly and ran in the mantle of soil and mud that clothed the bedrock. Toward the sea the alluvial muck was quite deep.

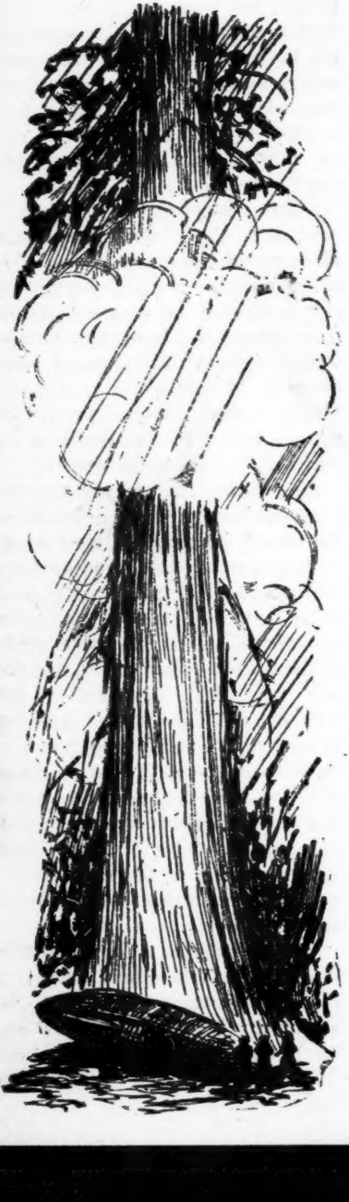
"Say," said Travis, "we have to put up with the ship's shadow, but what is that thing up there?"

He pointed to a narrow pointed, irregular wedge lying sidewise on the model's surface. It was a wedge of emptiness, in which nothing had registered. Except for its queer shape, it was the counterpart of the conical hollow in the very center of the model. That was the shadow cast vertically downward by the hull of the ship itself, since no amount of power would push the magnetrons through that thickness of alloy steel. Hence the pantos could only build an irregular empty cone topped off by the cigar-shaped upper contours of the vessel.

Hartley scrutinized the wedge of vacancy.

"It may be thrown by a moraine. Who knows, they may have had glaciers here once upon a time. Put the black pigment in and I'll test for granite."

The result he got was surprising.



"That's a funny thing" frowned Travis. "No action of ice or water ever left detritus like that, and I can't think of any normal upheaval that would cause it."

The cause of the shadow was granite, but in a form most unnatural. Far away from any known outcropping, it lay there in thin slabs. In the scale model they were of paper thinness, meaning that actually they were less than a yard thick. They were about ten times wider and occurred in all lengths up to several hundred yards. Not only did the slabs exist contrary to all known laws of granite cleavage, but their disposition was unorthodox. They lay roughly end to end, though by no means continuously since in spots there were wide vacancies. The pattern was that of a circuitous line that sometimes wound around low hills and at others went straight over them.

"What do you make of it?" asked Hartley. "The remnants of an old wall, perhaps, overthrown by an earthquake?"

"Too thin for a wall," shrugged Travis, "but let it go just now. When we extend the survey we will have to go up that way and then we'll take a look. Let's get on with the rest of the topography now. The light is getting dimmer and this rain is chilly."

Hartley put the Maggy to defining water, and the irregularities of the Venusian surface swiftly filled with clear plastic. Ravines turned into streams and saucerlike depressions into lakes. It was necessary for them to know the depths of the water hazards before they set out later in the crawler. And then, after shifting the quills, the pantos began sketching in the vegetable matter, reporting only what was composed of cellulose. The forests took shape, but not as clusters of individual trees. The scale was too small for that. They came out as masses of greenish glass or as a thin glaze where only grasses were.

"Hey," exclaimed Travis, pointing. "What's that there—another shadow?"

A clean V-shaped vacancy had been left by the moving arms—a tapering semiconical tunnel through the tree mass where it intersected it, and barrenness beyond. It was far too regular to have occurred in nature.

The appearance of it puzzled Hartley, for it terminated where it met the face of a mesa he had run in earlier. That would indicate that the unseen obstruction was softer than the sedimentary rocks but harder than wood. Hartley twisted a dial. The shadow persisted. He twisted other dials and stepped up the power. Nothing went through. Whatever it was was exceedingly hard.

"A ship!" said Travis, as the outlines of it suddenly began to grow under the weaving pantos. It was a cigar-shaped affair, and beside it were a pair of flat objects of the same material. Its lines were familiar. It was Driscoll's *Pathfinder*, and the two other objects were his crawlers. Their steel effectively masked what lay beyond them.

"It must have just landed," said Hartley. "It couldn't have been there before or I couldn't have shown the mesa complete."

"He used our beam to come in on, the skunk," said Travis, huskily, and wheeled toward the hatch.

"What are you going to do?"

"Call up the chief umpire and protest."

The umpire answered soothingly. "Now, now, Mr. Travis—there is no need of distressing yourself. Venus is big. Tremendously big. There's room enough for both of you. I would suggest that you make contact and reach an agreement. One of you go one way, the other the other. After all, Mr. Driscoll has suffered terrific losses in ships and men and you can afford to be generous. As for that, there is nothing in the rules to cover a conflict of this sort. Later you may take your complaint to the courts, but it is beyond my jurisdiction. Moreover, no part of Venus belongs to you yet—not until you have made an adequate survey."

"But we *have,*" insisted Travis, raging. "My partner and I have developed an instrument that maps in total darkness, or through solid barriers for that matter. It is by means of that that we discovered this trespasser. I demand—"

"Ridiculous," said the umpire, crisply. "My assistants have reported conditions down there. You are overruled."

The click of the severed connection left Travis in a state of sputtering fury. The umpire's stupid action was not final, of course. A display of the map would show his error. But Driscoll's intrusion was not only not sportsmanlike, it had an ominous quality. For he had power and the cunning to exploit every technicality. It would have been bad enough to have him on the other side of the planet, for sooner or later they were bound to meet. But to enter into conflict at the very outset was bad. Very bad.

Travis strode to the safe and took out the rules. He scanned them, fuming, but in the end had to concede that the umpire was partly right. The rules were silent on the point. Everything hinged on the quality of the survey made. The best mapped claim would win, regardless of priority. Travis relaxed a little. In that field the Maggy should win hands down over the clumsy bolometric methods Driscoll would probably employ. Hartley agreed with him in deciding to ignore Driscoll for the time being, and carry on.

"Tomorrow," Travis declared that night, as the three of them were at supper, "we will stow the topographic map in the hold, dismantle the Maggy, and move on to the far edge of what we've already done and add another sheet from there. Lorimer will have to stay here to maintain outside communications. We'll keep in touch with him by means of our walkie-talkies."

Lorimer nodded agreement, when Travis suddenly sat bolt upright.

"Psst! Do you hear what I hear?"

Outside was the rush and hiss of the rain that never stopped falling, but over it was a louder sound—the rumble and grating of heavy gears and the burbling of an exhaust pipe half submerged in slime. A crawler was coming. Then they heard a hail, faint and unintelligible. The crawler noises grew louder, then ceased. Someone was rapping on the hull.

"In the ship there—ship, ahoy!" came the hail again. Travis rose scowling and spat viciously. The voice was Driscoll's.

Under the distress clauses of the interplanetary code, he could not be denied entrance, but Travis' greeting when he opened the lock was frosty.

"I can't keep *you* out," he said, "but your gorillas stay in the crawler."

He closed the door in the faces of the four strong-arm men that Driscoll carried with him whenever he visited one of the outplanets.

"Now what do you want?"

"I?" laughed Driscoll, with easy politeness. "Why, nothing for myself. I wanted to see if you were all right, that's all. This is a beastly place, you know."

"You know we are all right," said Travis, sternly. "You followed down on our beam and have doubtless been eavesdropping ever since. Quit beating about the bush and come to the point."

Driscoll raised an eyebrow in mild surprise.

"Your hostility amazes me. However, I did have another purpose in coming. My assistant umpire carelessly came off without a sufficient supply of report forms. He asked me to obtain some from your man."

Travis silently indicated Lorimer, who rose and went to his booth. Travis and Hartley looked on with steely eyes as Driscoll followed. Nothing apparently passed between them except the pad of government forms, but there was justification in being profoundly suspicious of anything Driscoll did. Driscoll pocketed the forms and uttered profuse thanks all around, but just as he was about to leave he added,

"As I am here, we may as well discuss our future relations, since it seems we are the only two to get through."

"Now it comes out," said Travis, with a curl of the lip. "Let's have it."

The two partners listened stonily as the financier unreeled his come-on talk. Venus, he said suavely, was too vast a field to be exploited on a shoestring . . . skyports must be established and immense amounts of capital devoted to transportation alone . . the orderly development of the immense resources would require an army of technicians and astronomical amounts of specialized equipment. Simple pioneers could not cope with the problem. They simply cluttered up the field and impeded others.

"All right," snapped Travis. "So we impede. That is our right."

Driscoll was not upset. Look at the history of all such undertakings, he suggested, patiently. When did a pioneer ever cash in on his potentialities? Wouldn't it be better to accept the honor of having paved the way and then retire gracefully to easier fields? Would a million valors tempt them? Each, that is? No? Five million? Ten? Ten million valors was a lot of money. How much then? There need be no cutthroat race to stake out land. They could become partners in the big company by virtue of the transfer of their rights. Blocks of stock could be had in addition to the cash. Why not see the light?

"You're keeping us up," yawned Travis elaborately. "We've had a hard day. Good night."

Driscoll never dropped the mask of buttery smoothness, but as he bowed himself out there was an ominous glint in his eye.

"I never make an offer but once," he said.

"Fair enough," said Travis, and twisted the dogs home with a bang.

It was the earthquake that woke them up. It came in the middle of the night, just eleven hours after the shock of the afternoon. The din in the ship was terrific as every loose article banged against its neighbor. The dim standing lights flickered on and off and the bunks pitched wildly.

"We'd better get topside and check on the Maggy," said Hartley, blinking. "Rouse Lorimer to give us a hand."

But Lorimer was not in his bunk. They found him on the roof plate, since they wasted no time getting up there when they saw the hatch was open. It was Travis who was first up. He climbed through the hatch and stepped outside the shaft of light that stabbed upward into the misty haze of night. The beam from his sweeping torch fell upon no magnar or diorama, though the stanchions still stood swaying under the tarpaulin. The ruptured power lead still snaked across the slightly curving dome, but it terminated in a frayed end a yard away. There was nothing but a startled man in night clothes squinting into the flashlight's rays.

"I . . . I came up to secure the equipment you left here," stammered Lorimer. "I . . . it's not here!"

"We see it isn't," said Travis, grimly. He cast his light down onto the hull plates. They were beaded with moisture and streaked with rivulets, but a wide, glistening smear showed where something heavy had slid over.

"We'll have to allow for these earthquakes hereafter. They may be tidal," he said. His voice was harsh, but he held it rigidly even. There was no hint of reproach or dismay. "It's too dark to assess the damage now. Let's go back to bed."

Down below, Hartley cautiously closed the door of their room behind them.

"You took it calmly."

"Why not?" asked Travis, wearily. "The rat pushed them over, of course, but there isn't a vestige of proof. The earthquake *might* have done it, you know. But it serves to tip us off to what to expect."

"Like?"

"That Driscoll's preparations for surveying this accursed fogbound land are not so hot . . . that Lorimer is by now on his payroll, and probably tipped him off to the excellent performance of the Maggy . . . that that umpire up in the stratosphere is probably not his creature after all, but just a dope. Otherwise Driscoll wouldn't have slogged over here through the mud to make us those fancy offers. I knew then that he was afraid of us, but I didn't expect him to act so quickly. He was slick about it, too. Our evidence is nothing but surmise that would be laughed out of any court in the world."

"Then you think we're licked?"

Travis gave a short, hard laugh.

"After we dig the Maggy out of the muck in the morning I'll tell you more. There's no use worrying about it now."

Neither one of them went to sleep at once. For Travis' part he felt a sense of relief that the first blow was struck. It was outright warfare now, even if veiled. It served to remove inhibitions. Neither Travis nor Hartley had come to Venus inspired by greed. Their motives were otherwise—a compound of scientific curiosity; pride in their miracle-working machine; and to some extent the love of adventure. Vaguely behind it all there was the sober conviction that the human race must have new frontiers or stifle. They needed money, to be sure, as did everyone, but only in reasonable quantities. Yet Driscoll's avarice was such that he was attempting to defraud them of even that. Very well. The only retaliation the land shark could appreciate would be in kind. His lies and sabotage must be countered with blows where they hurt—in the pocketbook. Travis considered that angle dreamily, and then dropped off to sleep.

The severity of their loss did not become apparent until well after the dim, slow-creeping dawn. They found the fragments of the diorama deep in the slush beside the ship. It was broken into three big chunks and marred with jagged cracks. Glumly Hartley fished the pieces out and washed them off. But except for a few chips irretrievably lost, it could be fitted together and cemented back into a serviceable map. The Maggy that lay under it was different—it was beyond salvage.

It must have fallen first and then received the impact of the heavy mass of glass. Its unique tubes and delicate coils were hopelessly smashed. There were spare parts on board to make good some of the damage, but to fully restore the instrument meant a trip back to Earth. That they could not afford to do. Departure now would forfeit all they had gained.

"We're sunk," said Hartley, gloomily.

"You're never sunk until you admit you are," reminded Travis, grimly. "We still have the helios and the bolos, and a few other tricks up our sleeve."

"Like?"

"I've got a hunch I want to play. We'll talk about that later."

They carried the topographic model inside and repaired it. Then they took photographs of it and locked it away in the hold. The Maggy they sadly consigned to a vacant bin. The advantage it gave them was gone. From then on they would have to explore Venus the hard way.

"Pile our stuff into the crawler, Hartley, and warm the motor up."

Then Travis called the chief umpire by radio. He spoke with restraint, but he was firm in his demands. The umpire had certain duties and he should perform them. The stratosphere was not the place. He should bring his ship down to the surface and park it between the two contestants. Travis went on to report Lorimer's panic on the flight down, and his subsequent "carelessness" in tumbling their equipment overboard while ostensibly trying to secure it. He wanted Lorimer's immediate replacement, and a guard for the ship, for he intended leaving it to carry out the required field work. He did not propose to submit tamely to being stabbed in the back while he was gone, and concluded by reminding the umpire what happened to some negligent officials after the scandals on Mars. The umpire sputtered indignantly but said he would come on down.

An hour later Travis and Hartley piloted the slithering, splashing crawler away. Travis grinned at recalling the umpire's reaction when they showed him the map. The fellow had been honest in the belief that they could not possibly have accomplished so much in so brief a time. In other respects he was simply a run-of-the-mine civil servant, more afraid of violating the letter of his instructions than any other thing. He was weak and not too bright, but he was not venal. They could go off into the fog and leave him behind as a buffer with a fair degree of confidence, for before leaving they had seen that he sent through to Earth a complete report of progress to date.

"I still don't get what you're driving at," said Hartley, peering into the dirty yellow mist that had replaced the rain. He was steering. His chart was a photo of the model, his compass a gyro set to an arbitrary base line called "pseudo-north." He ducked one of the numerous ponds and got back on the course. It led straight to the nearest part of the curious winding granite slab formation.

"You will," said Travis cheerfully. He was less depressed by the crippling of the Maggy than his partner. "You thought those pieces of granite were the remnants of a wall. Maybe, but my theory is that they are what is left of a road. Our own ancients built some pretty good roads. It could be that this planet is inhabited, or was. If so, and that long line of broken slabs is a road, all we have to do is follow where it leads and maybe we'll bump into something that will help us."

"Yes, but I still don't see—" objected Hartley, still puzzled, but he had to pull up suddenly. They had been plowing through the gigantic grasses that rose in clumps to untold heights above them, but for a few moments the visibility happened to be amazingly good. There were instants when they could see all of fifty feet. And there before them lay one of the old slabs.

It was canted sharply and riven by stalks of the bamboolike growth that had upset it, but it was obvious that Travis' guess had hit the mark. Despite the slimy moss that clung to the flat, tilted surface, they could not miss the two deep grooves—distinct, parallel furrows, the marks left on a hard road by generations of shod cartwheels. The distance between the treads was just short of six feet, indicating that whatever vehicles had made them were not dissimilar in size to those used by men.

"This does it," said Travis, triumphantly. "Now we're getting somewhere. Do you remember when Lorimer went crazy on the trip down and cut our lights? We were studying some funny rock shapes on the top of a plateau. It looked like the ruins of a town to me. If so, it can't be far from here. In any event, a road always runs from somewhere to somewhere else. Turn right and let's see where this one takes us."

They drove on. Often they lost the load, but for awhile the map set them straight again. As Hartley manipulated the crawler's heavy wheel, Travis unloaded some of his views.

"We are required to make a survey. One look around shows how tough that is. Astronomical observations or triangulation as done on Earth are out of the question. We work in a medium that is worse than dark. That means we will have to triangulate by heat beacons, picked up by bolometer or radar or supersonics, all crude methods. A heat source is necessarily large, not a pinpoint like light. Radio is fuzzy in definition except where metal is the target. Supersonics are entirely unreliable in an atmosphere as humid as this. Now that the Maggy is on the blink it's a case of doing the best we can, and that best has to be better than Driscoll's."

"Well?" said Hartley, sheering to avoid a monster geyser that loomed up ahead. It was one of a row that was spouting boiling water thunderously into an already saturated air. The crawler slumped over into a quagmire and then had to wait other minutes while one of the recurrent earthquakes shook itself out. Simultaneously the thudding roar of a distant crater vomiting into action boomed in their ears.

"What a planet," gritted Hartley, hanging on to the bucking wheel. "When you do survey it what have you got? I bet whole gobs of this topography comes and goes overnight."

"Not improbable," said Travis, unperturbed. "Which makes it all the more desirable that we establish ourselves geographically—by latitude and longitude—if it could be done. Since that is tough we are left with a bolo survey. How good that will be will depend a lot on how good our base line is. Back there in the jungle where we were, and Driscoll is, it would take a year just to cut out one through those big trees. You would still have to mark the end ofthe line with a well-defined monument. Now cities are a lot more distinctive than trees or lakes or mountain peaks, and if we can find a few there, we have our corners ready made. Not only that, but cities promise other rewards—caches of ancient treasure, if the cities are as dead as the condition of this road seems to indicate they are."

Hartley nodded his agreement. By then they had progressed to the place where they were about to run off their Maggy built map.

"Just keep following the road," said Travis.

They continued to climb. After a bit the bamboo growth was less dense. It was also less gigantic, and the humid air was cooler, too, indicating a gain in altitude. The steamy vapor of the forest was replaced by the cold, swirling mists of the plateau. It was better going, and even seeing, in every way.

"Here we are," said Hartley, swerving to a stop as a rift in the fog showed what lay ahead, "and the dump is as dead as Babylon, from the looks of it."

Wreathed in trailers of clinging mist a high, crenellated wall stood athwart the road, pierced by a single, towered gate. To the left a part of it had been overthrown and tumbled forward into what may have been a moat, and chunks of rubble half filled the lower part of the gate. But Hartley surveyed it briefly and then slid in the crawler's gears. The clumsy vehicle grumbled, and then started to climb. In a moment it was through the relative gloom beneath the dark arch of the gate and clattering out into the streets of the dead city.

"Why, this town is half buried—like old Pompeii," exclaimed Travis, pointing. On either side there were rows of buildings, their lower floors submerged and with a mixture of mud and rubble masking the sills of the upper windows. "Its city walls have helped to hold the muck in or the rains should have washed it out long ago. No telling what we'll find when we go to digging."

They went on with their exploration. It was a fairly extensive town with many buildings of massive masonry, but it had been a dead city for a very, very long time. In the heart of it they came upon a great open square out of which protruded the upper portion of a sort of pyramid.

The pyramid was a six-sided affair, and curiously truncated. Slimy moss covered most of it, but they found handholds in crevices and managed to climb to the top. In that slanting surface they found a circular hole about a foot across, the only visible entrance, but when they crouched down and peered into it with sweeping flashlights they saw only a cavernous room half filled with stinking rain water.

"Well," said Travis, brightening and straightening up. "It looks as if we had something. Call up the umps on the walkie-talkie and tell him we have established our advanced base, but nothing more. Get it?"

The days that followed were ones of intensive exploration. They broke into the upper stories of the buried houses and dug out the volcanic ash and mud that filled them. They found bolted doors that had to be forced, but beyond them they discovered passages leading to the nether parts of the house where the doomed Venusians had fled in fright when extinction came upon them.

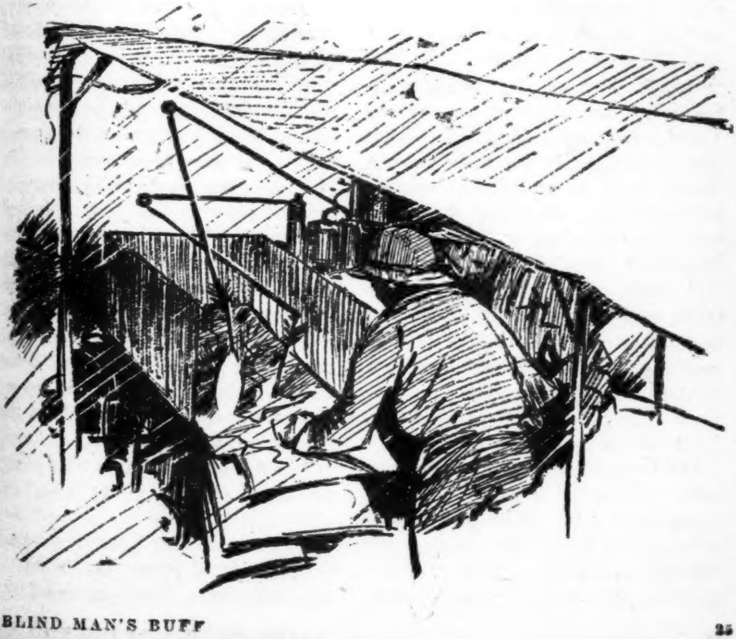
Considering the prevalence of moisture, what they found was in a surprisingly good state of preservation. The original catastrophe must have been accompanied by dry heat, for the remains of the Venus creatures had dessicated to mummified cadavers easy to study. They were remarkably anthropoid, differing from man chiefly in that they were taller and more slender and also had six digits to the hand and foot. Beside them were an abundance of artifacts of every description, including weapons and armor. The armor was of incredible richness in many cases, being of gold and silver damascene inlay in hard steel, the whole crusted with gems of rare fire and color. In a single day the boys found wealth enough to satisfy the greediest.

Travis shortly left the work of

cataloguing the archeological finds to Hartley. It was imperative, now that they had come upon this antique city, that they stake out a claim that would stand up against any machination of the Driscoll crowd. Therefore he set up his instruments and began the patient accumulation of recorded data.

The diffusion of light and heat was practically perfect, and the unaided eye had but the vaguest notion where the sun rose or set or the path it followed. But the helio was an instrument of rare delicacy and Travis felt he could find the sun within an accuracy of a degree or two. The bolometer readings were less satisfactory, since the greatest heat recorded was in midafternoon, but between them he was able to roughly know when it was apparent noon and more or less what the altitude of the sun was. The time of sunrise and sunset was indefinite, in the absence of knowledge as to what the horizons were, so he could not say what was the length of the actual day. But the noon to noon intervals, and the regularity of the tidal earthquakes gave him the length of the mean day. Venus revolved about its axis once in every twenty-two hours and a few minutes.

It was a triumph, of a sort.



"The latitude here is about sixty-five degrees," he told Hartley, jubilantly.

"Yeh. What about the longitude?"

"Zero—a hundred—anything I want to call it," grinned Travis. "Longitude is arbitrary. The first maps at home used the westernmost of the Azores for the kickoff point, thinking the world began there. Later the Americans used Washington, the French Paris, and so on until they got together on Greenwich. It doesn't matter really. The guy that states it first and hollers loudest wins."

But Travis' elation was short-lived. His figures were rough, but they had a clear trend. Every noon's altitude was greater than on the day before. Venus' axis was also tilted to the ecliptic. She had seasons. The sun was climbing in the sky, which meant it was spring. Travis groaned. He might have expected it, but it was a shock. He would have to track that elusive area of light for a full Venusian year—two-hundred and twenty-five terrestrial days—to establish the full curve. And it would take another year or two on top of that to make sure he was right. It was too long. Driscoll would beat him to the gun with an inferior survey. Once the deeds were passed the jig would be up.

He frowned as he considered another difficulty. He would win over topography with astronomical latitude, given time, but at that his latitude was fuzzy. Within a degree or so was not good enough. It left a probable error of up to a hundred miles. He was wasting time. He had better drop this nonsense and tackle the slow but surer way of piecemeal triangulation. It was when he broke that news to Hartley that Hartley brought better news to him.

"Say," he said, "today I found this picture in the cellar of a house. We ought to break into that pyramid."

He produced a thin sheet of bronze on which was engraved a view of the central square. The lines were very fine, as if etched, and they depicted the great plaza as it must have looked in its days of glory. The massive pyramid dominated the picture, and throngs of people swarmed in the square, holding their hands up in apparent supplication. A group of what were probably priests stood on the sloping platform made by the truncation, looking down on the masses below. It was apparently the day of some great festival, but the significant feature was that it showed a large portal leading into the pyramid at the level of the street. Its wide doors were open, and men and women were streaming into it.

Travis studied the etching. The great door was delineated as being on the face of the pyramid immediately below the lowest side of the truncation, a great help.

"Well," he said, "this tells where to dig. Let's get going."

Digging in the heavy, compact mud was hard going, but luckily it was not far. They hastened the work by rigging up a scraper and used the crawler for a drag. In the end they also had to employ the clumsy vehicle to batter in the heavy bronze leaves of the door, for they were securely fastened from within. Then the doors crashed inward and the crawler lunged through into the dim interior. They stopped and turned on its spotlight.

"It's a temple, not a tomb," pronounced Hartley.

It was a huge cubical room, bare of all furnishing except a high altar reached by a flight of wide steps. Above the altar rose a pylon on whose façe was a glittering sunburst, evidently of pure gold and richly set with jewels. About the altar stood a few vases, and on the floor lay the smashed remnants of others. From them spilled mounds of gems of all colors that sparkled brilliantly under the beam of light.

Travis swung the light around and swept the walls. On either side of the pylon were two huge embossed characters of the Venusian language, and around the entire room ran a wide frieze covered with ornamentation of interlaced hexagons and duodecagons. Every square foot of the walls underneath was given to elaborate mosaics. The theme of most were battles, confirming the opinion already reached that the Venusians were a warlike people. One big picture represented a ceremony which might have been a coronation. The most revealing of all was the last they came to.

It was done in dark-blue glazed tiles, and spangled with diamonds set in tiny silver rayed settings. Across it ran a wavy line of narrow gold ribbon, the highest point of which was adorned with a replica of the sun symbol.

"As I live and breathe," shouted Travis. "A map of the sky. I hope whoever laid out that sun track was an astronomer, not an artist," and he hastily rigged his camera.

It took hours to give the pyramid a thorough search. By means of winding stairs behind the pylon they came to upper levels, each being smaller than the one below. Most were the living quarters of the priests, and there were some dark cells for the sacrificial prisoners. Some day archeologists would translate the hieroglyphics and learn what those about to die had scribbled on the walls. There were other caches of treasure, too, but the greatest of all was the library. Here they found many scrolls, most of which were still in tubes sealed with wax. The majority were unintelligible, but they took away for study all that furnished clues in the way of illustrations and diagrams.

The topmost level was barred by another bronze door that defied all their efforts. In the end they had to get dynamite from the crawler and plant a charge. It was well they took ample cover on the floor below, for the aftermath of the explosion was unexpected. A freshet of trapped water came tumbling down the stairs and spread out on the floors of the rooms below. After a little it shrank to a dribble, and they climbed the slick, weedy steps to see the ultimate compartment.

Here they found another pylon and sunburst, though mossy from the dammed up water, presiding over a flat stone altar faintly illuminated by the light that shone through the hole overhead. Travis cast his flash about. Clinging algae showed the high watermark overhead. In the corners of the room were some strange instruments deeply incrusted with damp verdigris. They proved to be astrolabes, octants and transits of bizarre design, and one was fitted with a rude crystalline lens.

Travis and Hartley stood for a long time in sober thought, sizing up the place and trying to visualize the rites that had been conducted there.

"I think I'm beginning to get this," said Travis, suddenly. "It's clear enough these people were sunworshipers. This is a combined temple and observatory. The Egyptians did something of the kind, and so did the Aztecs. My hunch is that that hole is set so that at the summer solstice and no other time the sun would shine in here and illuminate this altar. What blood orgies followed then don't concern us now. The thing is that we have a check on my own orientation—that truncation up there must face south, and, if I can dope out just where that ray hit the altar, I'll have a verification of the altitude of the sun on that day. It's not all I need, but it is a help."

"The climate must have been a lot different in the old days," said Hartley, peering up through the gloom at the small, blurry spot of light.

"Of course it was. Vulcanism is the answer. For awhile this planet was stable, and then another era of mountain building set in. The scrap of geology we got from the Maggy showed us what the last upheavals have done. But it wasn't only earthquakes and eruptions that did the Venusians in. Extreme volcanic activity heaves a lot of water into the air. Our own ones do. They get it from the core of the earth where it is still held in solution in the general mass. The Venusians were losing cities fast and their skies were getting thicker. So the smarter ones of them got together and tried to escape. There must have been a very few advanced enough to conceive of spaceships—the Venusian Leonardo da Vincis, ahead of their time—but we know they managed it, and with a little better luck their race might have survived."

"All right," agreed Hartley. "But how does that help us?"

"We've got a swell observatory here—for Venus. The sun climbs higher every day. I'll keep checking it from the outside and you set up some equipment here. If your instruments register with mine the day it hits the solstice, my theory is proved. This will be the key point—longitude zero and whatever we find the latitude to be. Then we'll move on to another city and get another set of figures. It won't be long before we've whipped this thing."

That night they opened a bottle of their medical brandy and had a celebration. Then Hartley remembered that he hadn't made his routine report of the day. They didn't want well-meaning rescue parties come fumbling their way. He made the usual report that they were O.K., but finding the going slow.

"Ask how Driscoll is doing," prompted Travis, taking another swig.

"Not so good," said Hartley when he clicked off. "For us, that is. Umps says that he recalled the ships that got cold feet and deserted him, claiming that since they had not yet actually reached Earth they were still part of his expedition. So now he has scores of more parties out. Umps says he has taken in hundreds of square miles of territory on the other side of ours. They're even talking of sending for more gangs to start clearing a landing field."

"That's bad," growled Travis. He wouldn't have grudged it to any other man, but with Driscoll it was different. Calling in extra help was hitting below the belt. "Did he mention finding any cities?"

"Nope, but he said that Driscoll looked pretty cocky. He's probably playing it cagey like we are."

"Uh, huh," grunted Travis. It wasn't good news. There were plenty of smart men on Driscoll's payroll, and there was no copyright on unraveling antique mysteries.

The summer solstice occurred two days later, but it took several days more to make sure, for the sun declined too imperceptibly to make certain of it with his crude tools. Travis spent the time poring over the documents unearthed in the sacerdotal library and the photostats of those dug up in Persia. The hieroglyphics were quite beyond him except for the numerals. They stopped him for awhile until he angrily noticed that he had persistently overlooked the fact that there were twelve characters employed and not the usual ten.

"Of course," he declared sourly, "people with six fingers and toes *would* have a duodecimal based numerical system. I should have guessed it from their ornament, the shape of the pyramids, and all."

After that it did not take long to unravel the simpler computations left by the ancients, but in the absence of explanatory texts they remained incomprehensible operations in arithmetic.

Hartley broke open another scroll and unwound it on their makeshift desk.

"Say—" he shouted.

"A map!" exclaimed Travis, jumping to him. Then his hopes sank. It was a map, but of what? There was no shorelines or rivers or mountain ranges, nor was it another star map. It partook of the qualities of both. Sprinkled over it was a myriad of little black sunbursts, some smaller, some larger, and they were connected by a network of lines jagged as conventional lightning streaks. Each of the tiny symbols bore a pair of hieroglyphic characters, evidently the name of the place or thing, but he could not read them. Over all there was a light rectangular grid with numerals in fine script at their ends. Four of the horizontal lines were heavier than the others, and between the middle pair and in the center of the map were two double sunbursts done in gold leaf—one just beneath the upper line, one just above the lower.

They puzzled over the map for hours. Travis got out his code table of numerical values and ran in the translation of the figures. The vertical lines were marked with figures running up to three digits, the values being from zero to 999 on the duodecimal scale—just one short of the cube of the base. The horizontal lines had no number higher than 499 on the same scale. But all the values were consecutive, the horizontal series running from the top down, the vertical ones from right to left. The extreme upper and lower parts of the map were otherwise blank.

"It is a dead ringer for a Mercator projection," insisted Hartley.

"I know . . . wait!" Travis came suddenly out of his gloom into life, then laughed. "This shows what a fixed idea can do to you. We keep thinking in terms of three-hundred and sixty degrees to the circle. These people had a simpler system. They had one thousand seven hundred twenty-eight degrees to the full circle—the cube of twelve! Now it makes sense."

He snatched open a drawer and yanked out the photos they had taken inside the pyramid temple. One was the picture of the giant pylon above the main lower altar. He grabbed a pair of reading glasses and gave one to Hartley.

"See if we can match those characters anywhere. They may stand for the temple or the town. My hunch is that it will be in the middle latitudes, so you take the upper half and I'll take the lower."

In a little while Hartley let out a yelp. He found a matching pair. And a relentless search for the next half hour showed there was not another spot on the map with the same markings. That indicated that each of the small sunbursts stood for a pyramid, and the ragged lines between were probably the connecting highways. What they had was an ecclesiastical map of Venus.

There was much more to do before Travis was satisfied. He ran and dug out the measurements of the upper sacrificial chamber. He had all along suspected that the slope of the truncated roof was such as to be normal to the midsummer rays. It was twenty-one degrees from the horizontal. He deducted that value from the observed maximum altitude of the sun, sixty-seven. The answer was forty-six. That wasn't what the figures on the map showed, but the Venusian scheme was different. Latitude according to their convention ran from pole to pole, not from the equator both ways. Travis did some fast subtracting and convert-ing from the tiny Venusian degrees to the fat terrestrial ones. The answer was cheering. It came out to forty-six.

"It's in the bag now," chuckled Travis. "Now it all clears up. These golden double sunbursts denote the happy land—the Twice-Blest, so to speak. They get sun in the zenith twice a year inside the tropics, so the priests could have twice as many bloody parties. My money says that the temples there will be flat-topped, too. Way up here they had to tilt the top to let the sun in on the one day a year it did come, and the angle gets worse the closer you get to the poles. Up above the arctic circles there are days they don't have sun at all, so the temples are few and far between. But now that we have the key, what are we waiting for? Let's get going."

"Where to? The ship?"

"Not yet. We'll stop by at the next town and do a little double-check."

Without the map it would have been easy to have missed the place altogether. It lay in a shallow valley and all that showed above the reedy mud was a sloping piece of flat rock that might easily have passed for an outcropping of bedrock. They unplugged the solar hole of its muck and dropped a suction hose into the sacrificial chamber of the buried pyramid. The crawler's pump was set to work and soon the dark water was gushing out. The boys ate their lunch, and then went to work with crowbars to enlarge the hole. It was unnecessary to blast their way to the great hall far down in the base. The upper room was also adorned with the temple's designating characters. They scraped the slime off them and compared them with the map. They tallied.

When they were up in the crawler again and sheltered from the rain that had now grown from a steady, miserable drizzle to a roaring torrent, they sat through another spine-wrenching earthquake. They had time to think and appraise the magnitude of the fortune that had befallen them.

"This means that we own this whole doggoned planet?" asked Hartley, a little awe-struck.

Travis nodded.

"Hands down."

"But what are we going to do with it? I wouldn't live here if they gave it to me."

"I dunno. Kick Driscoll out and give it to the poor, I guess."

He grinned.

"I wouldn't live here either."

THE END.

* * * * * * * * *

Lawyer Kingman made a bad mistake when he tried outsmarting engineers on engineering. He made a different deal, though, in trying to out-communicate the communication experts of Venus Equilateral!

Beam Pirate

by GEORGE O. SMITH

Illustrated by Alfred

Mark Kingman was in a fine state of nerves. He looked upon life and the people in it as one views the dark-brown taste of a hangover. It seemed to him at the present time that the Lord had forsaken him, for the entire and complete success of the solar beam had been left only to Venus Equilateral by a sheer fluke of nature. Certainly he, nor anyone else, could have foreseen the Channing Layer, that effectively blocked any attempt to pierce it with the strange, sub-level energy spectrum over which the driver tube and the power-transmission tube worked, representing the extremes of the so-called spectrum.

But Venus Equilateral, for their part, were well set. Ships plied the spaceways using their self-contained power only during atmospheric passage, and paid Venus Equilateral well for the privilege. The Relay Station itself was powered on the solar beam, and the costly shipments of potential power had been stopped. There were other relay stations that belonged to the communications company; Luna, Deimos and Phobos, and the six that circled Venus in lieu of a sattellite; all were powered by the solar beam. And the solar observatory on Mercury used but little power, so the needs of the observatory became the sole income for Terran Electric's planetary rights of the solar beam, since Mercury owned no air of its own.

Mark Kingman was beginning to feel the brunt of Channing's statement to the effect that legal-minded men were of little importance when it came to the technical life in space, where men's lives and livelihood depended more on technical skill than upon the legal pattern set for their protection in the complex society of planetary civilization.

It seemed that way. For instead of gaining their ends by legal restrictions on the power-transmission tube investigations, Terran Electric had lost their chance. Venus Equilateral had the legal right to tinker with the transmission tubes all they wanted to, and in return, Terran Electric held all of the planetary rights to Venus Equilateral's solar beam—which in the domain covered by natural celestial bodies was about as valuable as the gold-mining rights to the crater Tycho.

And everyone knows that Luna, as a valuable piece of real estate, is useful only to Venus Equilateral as a place to plant the Lunar Relay Station that handled the Terran Beam and punched downward at the Heaviside Layer. Luna's valuable assets as to mineral rights consisted of a bit of talc—no longer used because of plastic engineering—and pumice—no longer used because of synthetic engineering.

And Kingman knew that only if Terra were not abundant in granite would the Lunar granite come in handy as a source of tombstones; and that made him writhe because when he thought of tombstones he also thought of his position with Terran Electric, which had been endangered because of his own legal connivances.

He swore vengeance.

So, like the man who doggedly makes the same mistake twice in a row, Kingman was going to move Heaven, Hell, and the three planets in an effort to take a swing at the same jaw that had caught his fist between its teeth before.

Out through the window of his office, he saw men toiling with the big tube on the far roof; the selfsame tube that had carried the terrific load of Venus Equilateral for ten days without interruption and with no apparent overload. Here on Terra, its output meter, operating through a dummy load, showed not the slightest inclination to leave the bottom peg and seek a home among the higher brackets.

The Channing Layer barred the passage of radiation of this so-called sub-etheric energy as effectively as the Heaviside Layer had blocked Interplanetary Communications for many, many years.

So Kingman cursed and hated himself for having backed himself into trouble. But Kingman was not a complete fool. He was a brilliant attorney, and his record had placed him in the position of Assistant Chief Attorney for Terran Electric, which was a place of no mean importance. He had been licked on the other fellow's ground, with the other fellow's tools.

He picked up papers that carried, side by side, the relative assets of Venus Equilateral and Terran Electric. He studied them and thought deeply.

To his scrutiny, the figures seemed about equal, though perhaps the Interplanetary Communications Co. was a bit ahead.

But—he had been licked on the other fellow's ground with the other fellow's tools; he thought that if he fought on his own ground, with his own tools, he might be able to swing the deal.

And Terran Electric was not without a modicum of experience in the tools of the other fellow. His engineering department was brilliant and efficient, too: at least the equal of Channing and Franks and their gang of laughing gadgeteers. That not only gave him the edge of having his own tools and his own ground, but a bit of the other fellow's instruments too. Certainly his engineering department should be able to think of something good.

William Cartright, business manager for Venus Equilateral, interrupted Don and Walt in a discussion. He carried a page of stock market quotations and a few hundred feet of ticker tape.

Channing put down his pencil and leaned back in his chair. Walt did likewise, and said: "What's brewing?"

"Something I do not like."

"So?"

"The stock has been cutting didoes. We've been up and down so much it looks like a scenic railway."

"How do we come out?"

"Even, mostly; but from my experience, I would say that some bird is playing hooky with Venus Equilateral, Preferred. The common is even worse."

"Look bad?"

"Not too good. It is more than possible that some guy with money and the desire might be able to hook a large slice of V.E. Preferred. I don't think they could get control, but they could garner a plurality from stock outstanding on the planets. Most of the preferred stuff is in the possession of the folks out here, you know, but aside from yourself, Walt, and a couple of dozen of the executive personnel, the stock is spread pretty thin. The common stock has a lot of itself running around loose Outside. Look!"

Cartright began to run off the many yards of ticker tape. "Here, some guy dumped a boatload at Canalopsis, and some other guy glommed on to a large hunk at New York. The Northern Landing Exchange showed a bit of irregularity during the couple of hours of tinkering, and the irregularity was increased because some bright guy took advantage of it and sold short." He reeled off a few yards and then said: "Next, we have the opposite tale. Stuff was dumped at Northern Landing, and there was a wild flurry of bulling at Canalopsis. The Terran Exchange was just flopping up and down in a general upheaval, with the boys selling at the top and buying at the bottom. That makes money, you know, and if you can make the market tick your way—I mean control enough stuff—your purchases at the bottom send the market up a few points and then you dump it, and it drops again. It wouldn't take more than a point or two to make a guy rich, if you had enough stock and could continue to make the market vacillate."

"That's so," agreed Don. "Look, Bill, why don't we set one of our Terran agents to tinkering too? Get one of our best men to try to outguess the market. As long as it is being done systematically, he should be able to follow the other guy's thinking. That's the best we can do unless we go gestapo and start listening in on all the stuff that goes through the Station here."

"Would that help?"

"Yeah, but we'd all land in the hoosegow for breaking the secrecy legislation. You know. 'No one shall . . . intercept . . . transmit . . eavesdrop upon . . . any message not intended for the listener, and . . . shall not . . . be party to the use of any information gained . . . et cetera.' That's us. The trouble is this lag between the worlds. They can prearrange their bulling and bearing ahead of time and play smart. With a little luck, they can get the three markets working just so—going up at Northern Landing; down at Terra; and up again at Canalopsis, just like waves in a rope. By playing fast and loose on paper, they can really run things hell, west, and crooked. Illegal, probably, since they each will no doubt claim to have all the stock in their possession, and yet will be able to sell and buy the same stock at the same time in three places."

"Sounds slightly precarious to me," objected Cartright.

"Not at all, if you figure things just right. At a given instant, Pete may be buying at sixty-five on Venus; Joe may be selling like furious at seventy-one on Mars; and Jimmy may be bucking him up again by buying at sixty-five on Terra. Then the picture and the tickers catch up with one another, and Joe will start buying again at sixty-five, whilst Pete and Jimmy are selling at seventy-one. Once they get their periodicity running, they're able to tinker the market for quite a time. That's where your man comes in, Bill. Have him study the market and step in at the right time and grab us all a few cheap ones. Get me?"

"Sure," said Cartright. "I get it. In that way, we'll tend to stabilize the market, as well as getting the other guy's shares."

"Right. I'll leave it up to you. Handle this thing for the best interests of all of us."

Cartright smiled once again, and left with a thoughtful expression on his face. Channing picked up the miniature of the power-transmission tube and studied it as though the interruption had not occurred. "We'll have to use about four of these per stage," he said. "We'll have to use an input terminal tube to accept the stuff from the previous stage, drop it across the low-resistance load, resistance couple the stage to another output terminal tube where we can make use of the coupling circuits without feedback. From there into the next tube, with the high resistance load, and out of the power-putter-outer tube across the desk to the next four-bottle stage."

"That's getting complicated," said Walt. "Four tubes per stage of amplification."

"Sure. As the arts and sciences get more advanced, things tend to get more complicated."

"That's essentially correct," agreed Walt with a smile. "But you're foreguessing. We haven't even got a detector that will detect driver radiation."

"I know, and perhaps this thing will not work. But after all, we've got the tubes and we might as well think them out just in case. We'll detect driver radiation soon enough, and then we might as well have a few odd thoughts on how to amplify it for public use. Nothing would tickle me more than to increase those three circles on our letterhead to four. 'Planet to Planet, and Ship to Ship' is our hope. This one-way business is not to my liking. How much easier it would have been if I'd been able to squirt a call in to the Station when I was floating out there beyond Jove in that wrecked ship. That gave me to think, Walt. Driver-radiation detection is the answer."

"How so?"

"We'll use the detector to direct our radio beam, and the ship can have a similar gadget coupled to their beam, detecting a pair of drivers set at one hundred and eighty degrees from one another so the thrust won't upset the Station's celestial alignment. We can point one of them at the ship's course, even, making it easier for them."

"Speaking of direction," said Walt thoughtfully, "have you figured out why the solar beam is always pointing behind Sol?"

"I haven't given that much thought. I've always thought that it was due to the alignment plates not being in linear perfection so that the power beam bends. They can make the thing turn a perfect right angle, you know."

"Well, I've been toying with the resurrected heap you dropped into Lake Michigan a couple of months ago, and I've got a good one for you. You know how the beam seems to lock into place when we've got it turned to Sol, not enough to make it certain, but more than detectably directive?"

"Yep. We could toss out the motor control that keeps her face turned to the sun."

"That's what I was hoping to gain—" started Walt, but he stopped as the door opened and Arden entered, followed by a man and woman.

"Hello," said Walt in a tone of admiration.

"This is Jim Baler and his sister Christine," said Arden. "Baler, the guy with the worried look on his face is my legally wedded spouse—souse—no, spouse. And the guy with the boudoir gorilla gleam in his vulpine eye is that old vulture, Walt Franks."

Walt took the introduction in his stride and offered Christine his chair. Arden stuck her tongue out at him, but Walt shrugged it off, ignoring her. Channing shook hands with Jim Baler and then sought the "S" drawer of his file cabinet. He found the Scotch and the soda, and then grinned: "Should have the ice under 'I,' but its sort of perishable, and so we keep it in the refrigerator. Arden, breach the 'G' drawer and haul out the glasses, will you please? I suppose we could refrigerate the whole cabinet, but it wouldn't sound right if people heard that we kept their mail on ice. Well—"

"Here's how, if we don't already know," said Walt, clinking glasses with Christine.

"Walt earned that 'wolf' title honestly," laughed Arden, "he likes to think. Frankly, he's a sheep in wolf's clothing!"

"What are his other attributes?" asked Christine.

"He invents. He scribbles a bit. He cuts doodles on tablecloths, and he manages to get in the way all the time," said Don. "We keep him around the place for his entertainment value."

"Why—"

"Quiet, Walter, or I shall explain the sordid details of the Walter Franks Electron Gun."

"What was that one?" asked Christine.

"You really wouldn't want to know," Walt told her.

"Oh, but I would."

"Yeah," growled Franks, "you would."

"Would you rather hear it from him, or me?" Arden asked.

"He'll tell me," said Christine. Her tone was positive and assured.

"And that'll take care of that," said Arden. "But I think we interrupted something. What were you saying about gaining, Walt?"

"Oh, I was saying that I was tinkering around the skyways with the *Anopheles*—that's the ship we hooked up with the solar beam for power, you know—and I got to wondering about that discrepancy. The faster you go, the greater is the angular displacement, and then with some measurements, I came up with a bugger factor—"

"Woah, goodness," laughed Christine. "What is a bugger factor?"

"You'll learn," said Arden, "that the boys out here have a language all their own. I've heard them use that one before. The bugger factor is a sort of multiplying, or dividing, or additive, or subtractive quantity. You perform the mathematical operation with the bugger factor, and your original wrong answer turns into the right answer."

"Is it accepted?"

"Oh sure," answered Arden.

"People don't realize it, but that string of 4's in the derivation of Bode's Law is a bugger factor."

"You," said Christine to Walt, "will also tell me what Bode's Law is—but later."

"O.K.," grinned Walt. "At any rate, I came up with a bugger factor that gave me to think. The darned solar beam points to where Sol actually is!"

"Whoosh!" exclaimed Channing. "You don't suppose we're tinkering with the medium that propagates the law of gravity?"

"I don't know. I wouldn't know. Has anyone ever tried to measure the velocity of propagation of the attraction of gravity?"

"No, and no one will until we find some way of modulating it."

Jim Baler smiled. "No wonder Barney was a little wacky when he got home. I come out here to take a look around and maybe give a lift to your gang on the transmission tube—and bump right into a discussion on the possibility of modulating the law of gravity!"

"Not the law, Jim, just the force."

"Now he gets technical about it. You started out a couple of months ago to detect driver radiation, and ended up by inventing a beam that draws power out of the sun. Think you'll ever find the driver radiation?"

"Probably."

"Yeah," drawled Arden. "And I'll bet a hat that when they do, they won't have any use for it. I've seen 'em work before."

"Incidentally," asked Christine, "you mentioned the *Anopheles*, and I think that is the first ship I've ever heard of that hasn't a feminine name. How come?"

"The mosquito that does the damage is the female," grinned Jim. "The Mojave spaceyards owns a sort of tender craft. It has a couple of big cranes on the top and a whole assortment of girders near the bottom. It looks like, and is also called: *The Praying Mantis.* Those are also female; at least the ones that aren't afraid of their shadow are."

Channing said suddenly: "Walt, have you tried the propagation-time of the solar beam on the *Anopheles?*"

"No. How would we go about doing that?"

"By leaving the controls set for 1-G, and then starting the ship by swapping the tube energizing voltages from test power to operating power."

"Should that tell us?"

"Sure. As we know, the amount of energy radiated from the sun upon a spot the size of our solar tube is a matter of peanuts compared to the stuff we get out of it. Ergo, our beam must go to Sol and collect the power and draw it back down the beam. Measure the transit-time, and we'll know."

"That's an idea. I've got a micro-clock in the lab. We can measure it to a thousandth of a second. Anyone like to get shook up?"

"How?" asked Jim.

"Snapping from zero to 1-G all to oncet-like isn't too gentle. She'll knock your eyes out."

"Sounds like fun. I'm elected."

"So am I," insisted Christine.

"That's out," said Jim. "I know what he's talking about."

"So do I," said Arden. "Don't do it."

"Well, what better have you to offer?"

"You and I are going down to the Mall."

Channing groaned in mock anguish. "Here goes another closet full of female haberdashery. I'm going to close that corridor some day, or put a ceiling on the quantity of sales, or make it illegal to sell a woman anything unless she can prove that 'she has nothing to wear!'"

"That, I'd like to see," said Walt.

"You would," snorted Arden. "Come on, Chris. Better than the best of three worlds is available."

"That sort of leaves me all alone," said Don. "I'm going to look up Wes Farrell and see if he's been able to make anything worth looking at for a driver detector."

Don found Wes in the laboratory, pouring over a complicated circuit. Farrell was muttering under his breath, and probing deep into the maze of haywire on the bench.

"Wes, when you get to talking to yourself, it's time to take a jaunt to Joe's."

"Not right now," objected Wes. "I haven't got that hollow leg that your gang seem to have developed. Besides, I'm on the trail of something."

"Yes?" Channing forgot about Joe's, and was all interest.

"I got a wiggle out of the meter there a few minutes ago. I'm trying to get another one."

"What was it like?"

"Wavered up and down like fierce for about a minute after I turned it on. Then it died quick, and has been dead ever since."

"Could it have been anything cockeyed with the instruments?"

"Nope. I've checked every part in this circuit, and everything is as good as it ever will be. No, something external caused that response."

"You've tried the solar tube with a dynode of the same alloy as the driver cathodes?"

"Uh-huh. Nothing at all. Oh, I'll take that back. I got a scratch. With a pre-meter gain of about four hundred decibels, I read three micromicroamperes. That was detected from a driver tube forty feet across the room, running at full output. I wondered for a minute whether the opposing driver was doing any cancellation, and so I took a chance and killed it for about a half second, but that wasn't it."

"Nuts. Does the stuff attenuate with distance?"

"As best as I could measure, it was something to the tune of inversely proportional to the cube root of the distance. That's normal for beams of a not-too-tight nature and it shows that the stuff isn't globularly radiated. But the amplifier gain was hanging right on the limit of possible amplification, and the meter was as sensitive as a meter can be made, I think. You couldn't talk from one end of Venus Equilateral to the other with a set like that."

"No, I guess you're right. Hey! Look!"

The meter took a sudden upswing, danced for a minute, and died once more.

"What have you got in there? What did you change?"

"Oh, I got foolish and tried a tuned circuit across the output of one of the miniature transmission tubes. It's far enough away from the big beams and stuff at the North end so that none of the leakage can cause trouble. Besides, I'm not getting anything like our beam transmissions."

Channing laughed. "Uh-huh, looks to me like you're not getting much of anything at all."

Farrell smiled wryly. "Yeah, that's so," he agreed. "But look, Don, Hertz himself didn't collect a transcontinental short-wave broadcast on his first attempt."

"If Hertz had been forced to rely upon vacuum tubes, his theories couldn't have been formulated, I think," said Channing. "At least, not by him. The easier frequencies and wave lengths are too long; a five hundred meter dipole can't be set up in a small room for laboratory tinkering. The kind of frequencies that come of dipoles a couple of feet long, such as Hertz used, are pretty hard to work with unless you have special tubes."

"Hertz had rotten detectors, too. But he made his experiments with spark-gap generators, which gave sufficient high-peak transients to induce spark-magnitude voltages in his receiving dipole."

"I'm not too certain of that tuned-circuit idea of yours, Wes. Go ahead and tinker to your heart's content, but remember that I'm skeptical of the standard resonance idea."

"Why?"

"Because we've been tinkering with driver tubes for years and years—and we have also been gadgeting up detectors, radio hootnannies, and stuff of the electronic spectrum all the way from direct current to hard X rays, and we have yet to have anything react to driver radiation. Ergo, I'm skeptical."

The call bell rang for Channing, and he answered. It was Walt Franks.

"Don," he said with a laugh in his voice, though it was apparent that he felt slightly guilty about laughing, "got a 'gram from Addison, the project engineer on the solar beam from Terran Electric. Says: 'Finally got through Channing Layer. Power by the megawatt-hour in great shape. But the atmosphere from the Channing Layer right down to the snout of the tube is a dull red scintillation. Something like the driver-tube trail—but it ionizes the atmosphere into ozone. Power by the megawatt, and ozone by the megaton."

"Ozone, hey? Lots of it?"

"Plenty, according to the rest of this. It looks to me like a sort of 'denatured' power system. There it is, all nice and potent, cheap, and unlicensed. But the second swallow going down meets the first one on the way back. Power they got—but the ozone they can't take; it's poisonous like a nice dose of chlorine. Poor Terran Electric!"

Mark Kingman sat in the control room of a ship of space, and worried. Below the dome, Venus covered three quarters of the sky, and it circled slowly as the Terran Electric ship oscillated gently up and down.

Before Kingman, on the desk, were pages of stock market reports. On a blackboard, a jagged line denoted the vacillation of Interplanetary Communications, Preferred. This phase of his plan was working to perfection. Gradually, he was burning share after share out of uninterested hands, by his depredations. Soon he would have enough stock in Interplanetary to stage a grand show, and then he could swing the thing his way.

His worry was not with this affair.

He gloated over that. His belief that he could beat the Venus Equilateral crowd if he fought them on his ground with his weapon was being corroborated. That, plus the fact that he was using some of Venus Equilateral's own thunder to do the job, was giving him to think that it was but a matter of time.

And, he laughed, the poor fools were not aware of their peril. Oh, some bird was trying to buck him, but he was not prepared as Kingman was, nor had he the source of information that Kingman had.

No, the thing that worried him was—

And there it came again! A wild, cacophonous wailing, like a whole orchestra of instruments playing at random, in random keys. It shook the very roots of the body, that terrible caterwauling, and not only did it shake the body, and the mind, but it actually caused loose plates to rattle in the bulkhead, and the cabinet doors followed in unison. The diapason stop was out for noon, and the racket filled the small control room and bounced back and forth, dinning at the ears of Kingman as it went echoing by. It penetrated to the upper reaches of the ship, and the crew gritted their teeth and cursed the necessity of being able to hear orders, for cotton plugs would have been a godsend and a curse simultaneously. Anything that would blot that racket out would also deafen them to the vital orders necessary to the operation of the ship in this precarious poising maneuver.

Two hundred sheer watts of undistorted audio power boomed forth in that tiny room—two hundred watts of pure, undistorted power to racket forth something that probably started out as sheer distortion.

And yet—

Faintly striving against that fearful racket there came a piping, flat-sounding human voice that said: "Kingman! I.C. Preferred just hit eighty-nine!"

Kingman scowled and punched on the intership teletype machine. Using the communicator set with that racket would have been impossible.

The radio man read the note that

appeared on his 'type, and smiled grimly. He saw to his helio-mirror and sighted through a fine telescope at a spot on Venus, three thousand miles below. The helio began to send its flashing signal to this isolated spot near the Boiling River, and it was read, acknowledged, and repeated for safety's sake. The radio man flashed "O.K." and went back to his forty-seventh game of chess with the assistant pilot.

The helio man on the Boiling River read the message, grinned, and stepped to the telephone. He called a number at Northern Landing, and a tight beam sped across the Northern quarter of Venus to a man connected with the Venus Stock Market. The man nodded, and said to another: "Buy fifteen hundred—use the name of Ralph Gantry this time."

The stock purchased under the name of Ralph Gantry was signed, sealed, and delivered exactly fourteen minutes before the ticker projection on the grand wall of the Exchange showed the I.C. Preferred stock turn the bottom curve and start upward by hitting Eighty-nine!

Back in the Terran Electric spaceship, Kingman's ears were still beset by the roaring, alien music.

He was sitting in his chair with his head between his hands, and did not see the man approaching the instrument panel with a pair of side-cutters in one hand. The man reached the panel, lifted it slightly, and reached forward. Then Kingman, hearing a slight imperfection in the wail of the speaker, looked up, jumped from his chair, and tackled the engineer.

"You blasted fool!" blazed Kingman. "You idiot!"

The music stopped at his third word, and the scream of his voice in the silence of the room almost scared Kingman himself.

"Mark, I'm going nuts. I can't stand that racket."

"You're going to stand it. Unless you can get something to cut it out."

"I can't. I'm not brilliant enough to devise a circuit that will cut that noise and still permit the entry of your fellow on Luna."

"Then you'll live with it."

"Mark, why can't we take that relay apart and work on it?"

"Ben, as far as I know, that relay is what Channing and his gang would give their whole Station for—and will, soon enough. I don't care how it works—or why."

"That's no way to make progress," objected Ben.

"Yeah, but we've got the only detector for driver radiation in this part of the universe! I'm not going to have it wrecked by a screwball engineer who doesn't give a care what's going on as long as he can tinker with something new and different. What do we know about it? Nothing. Therefore how can you learn anything about it? What would you look for? What would you expect to find?"

"But where is that music coming from?"

"I don't know. As best as we can calculate, driver radiation propagates at the square of the speed of light, and that gives us a twenty-four minute edge on Venus Equilateral at the present time. For all I know, that music may be coming from the other end of the galaxy. At the square of the speed of light, you could talk to Centauri and get an answer in not too long."

"But if we had a chance to tinker with that relay, we might be able to find out what tunes it and then we can tune in the Lunar station and tune out that cat-melody."

"I'm running this show—and this relay is going to stay right where it is. I don't care a hoot about the control circuit it breaks; those contacts are set, somehow, so that we can detect driver radiation, and I'm not taking any chances of having it ruined."

"Can't you turn the gain down, at least?"

"Nope. We'd miss the gang at Luna."

The speaker spoke in that faint, flat-toned human voice again. It was easy to see that all that gain was necessary to back up the obviously faint response of Kingman's detector. The speaker said: "Kingman! Addison got power through the Channing Layer!"

That was all for about an hour. Meanwhile, the mewling tones burst forth again and again, assaulting the ears with intent to do damage. The messages were terse and for the most part, interesting. They gave the market reports; they intercepted the beam transmissions through the Terran Heaviside Layer before they got through the Lunar Relay Station, inspected the swiftly-moving tape and transmitted the juicy morsels to Kingman via the big driver tube that stood poised outside of the landed spaceship.

Kingman enjoyed an hour of celebration at Addison's success, and then the joy turned to bitter hate as the message came through telling of the ozone that resulted in the passage of the solar beam through the atmosphere. The success of the beam, and the utter impossibility of using it were far worse than the original fact of the beam's failure to pass the Channing Layer.

So Kingman went back to his stock market machinations, and applied himself diligently. And as the days wore on, Kingman's group manipulated their watered stock and ran the price up and down at will, and after each cycle Kingman's outfit owned just one bit more of Venus Equilateral.

Terran Electric would emerge from this battle with Interplanetary Communications as a subsidiary—with Kingman at the helm!

Walt Franks entered Channing's office with a wild-eyed look on his face. "Don! C^2!"

"Huh? What are you driving about?"

"C^2. The speed of light, squared!"

"Fast—but what is it?"

"The solar beam! It propagates at C^2!"

"Oh, now look. Nothing can travel that fast!"

"Maybe this isn't *something!*"

"It has energy, energy has mass, mass cannot travel faster than the limiting speed of light."

"O.K. It can't do it. But unless my measurements are all haywire, the beam gets to Sol and back at C^2. I can prove it."

"Yeah? How? You couldn't possibly measure an interval so small as two times sixty-seven million miles—the radius of Venus' orbit—traversed at the speed of light squared."

"No. I admit that. But, Don, I got power out of Sirius!"

"You WHAT?" yelled Channing.

"Got power out of Sirius. And unless I can't use a micro-clock, it figured out from here to Sirius and back with the bacon in just about ninety-three percent of the speed of light, squared. Seven percent is well within the experimental error, I think, since we think of Sirius as being eight and one half light-years away. That's probably not too accurate as a matter of fact, but it's the figure I used. But here we are. Power from Sirius at C^2. Thirty-five billion miles per second! This stuff doesn't care how many laws it breaks!"

"Hm-m-m. C^2, hey? Oh, lovely. Look, Walt, let's run up and take a whirl at Wes Farrell's detector. I'm beginning to envision person-to-person service, ship-to-ship service, and possibly the first Interplanet Network. Imagine hearing a play-by-play description of the Interplanetary Series!"

"Wool-gathering," snorted Walt. "We've gotta catch our detector first!"

"Wes has something. First glimmer we've had. I think this is the time to rush into it with all feet and start pushing!"

"O.K. Who do we want?"

"Same gang as usual. Charley and Freddy Thomas, Walton, Jim Warren, Wes Farrell, of course, and you can get Jim Baler into it too. No, Walt, Christine Baler is not the kind of people you haul into a screwdriver meeting."

"I was merely thinking."

"I know. But you're needed, and if she were around, you'd be a total loss as far as cerebration."

"I like her."

"So does Barney Carroll."

"Um. Hadn't thought of that one. O.K., no Christine in our conference. I'll have Jeanne call the screwballs on the communicator."

They dribbled into Farrell's laboratory one by one, and then Don said:

"We have a detector. It is about as efficient as a slab of marble; only more so. We can get a tinkle of about ten micromicroamps at twenty feet distance from a driver tube using eight KVA input, which if we rate this in the usual spaceship efficiency, comes to about one-half G. That's about standard, for driver tubes, since they run four to a ship at 2-G total.

"Now, that is peanuts. We should be able to wind a megammeter around the peg at twenty feet. Why the red ironization comes out of the tube and hits our so-called detector, and the amount of ozone it creates is terrific. Yet we can't get a good reading out of it."

Walt asked: "Wes, what worked, finally?"

"A four-turn coil on a ceramic form, in series with a twenty micromicrofarad tuning condenser. I've been using a circular plate as a collector."

"Does it tune?"

"Nope. Funny thing, though, it won't work without a condenser in the circuit. I can use anything at all there without tuning it. But, darn it, the coil is the only one that works."

"That's slightly ridiculous. Have you reconstructed all factors?"

"Inductance, distributed capacity, and factor 'Q' are all right on the button with two more I made. Nothing dioding."

"Hm-m-m. This takes the cake. Nothing works, you say?"

"Nothing in my mind. I've tried about three hundred similar coils, and not a wiggle since. That's the only one."

Charley Thomas said: "Wes, have you tried your tube-amplifier system ahead of it?"

"Yes, and nothing at all happens then. I don't understand that one, because we know that any kind of input power will be re-beamed as similar power. I should think that the thing would amplify the same kind of stuff. I've used a solar beam miniature with a driver-alloy dynode in it, but that doesn't work either."

"Shucks," said Charley.

Don stood up and picked up the coil. "Fellows, I'm going to make a grand, old college try!"

"Yes?" asked Walt.

"I've got a grand idea, here. One, I'm still remembering that business of making the receptor dynode of the same alloy as the transmitter cathode. I've a hunch that this thing is not so much an inductor, but something sour in the way of alloy-selectivity. If I'm right, I may cut this in half, and make two detectors, each of similar characteristics. Shall I?"

"Go ahead. We've established the fact that it is not the physico-electrical characteristics of that coil," said Wes. "I, too, took my chances and rewound that same wire on a couple of other forms. So it doesn't count as far as an inductance goes. So we can't ruin anything but the total make-up of the wire. I think we may be able to re-establish the wire by self-welding if your idea doesn't work. Now, unless we want to search the three planets for another hunk of wire to work like this one did, without knowing what to look for and therefore trying every foot of wire on three planets—"

"I'll cut it," said Channing with a smile. His cutters snipped, and then fastened one end of the wire to the coil, stripping the other portion off and handing it to Charley Thomas, who rewound it on another form.

"Now," said Don, "crank up your outfit and we'll try this hunk."

The beam tubes were fired up, and the smell of ozone began to make itself prominent. Channing cranked up the air-vent capacity to remove the ozone more swiftly. The men applied themselves to the detector circuits, and Wes, who recognized the results, said: "This hunk works. About as good as the whole coil."

Channing replaced the first coil with the second. Wes inspected the results and said: "Not quite as good, but it does work."

Walt nodded, and said: "Maybe it should be incandescent."

"That's a thought. Our solar beam uses an incandescent dynode." Channing removed the second coil and handed it to Freddy. "Take this thing down to the metallurgical lab and tell 'em to analyze it right down to the trace of sodium that seems to be in everything. I want quantitative figures on every element in it. Also, cut off a hunk and see if the crystallographic expert can detect anything peculiar, that would make this hunk of copper wire different from any other hunk. Follow?"

"Yup," said Freddy. "We'll also start making similar alloys with a few percent variation on the composition metals. Right?"

"That's the ticket. Wes, can we evacuate a tube with this wire in it and make it incandescent?"

"Let's evacuate the room. I like that stunt."

"You're the engineer on this trick. Do it your way."

"Thanks. I get the program, all right. Why not have Charley build us a modulator for the driver tube? Then when we get this thing perfected, we'll have some way to test it."

"Can do, Charley?"

"I think so. It's easy. We'll just modulate the cathode current of the electron guns that bombard the big cathode. That is the way we adjust for drive; it should work as a means of amplitude-modulation."

"O. K.," said Channing. "We're on the rails for this one. We'll get together as soon as our various laboratories have their answers and have something further to work with."

Above Venus, Mark Kingman was listening to the wailing roar of alien symphony and cursing because he could hardly hear the voice of his Lunar accomplice saying: "V. E. Preferred just hit one hundred and two!"

Fifteen minutes before the peak hit Northern Landing, share after share was being dumped, and in addition, a message was on its way back to Terra. It went on the regular beam transmission through Venus Equilateral, carefully coded. It said:

"Have sufficient stock and additional collateral to ply the first pressure. Apply phase two of plan. Kingman."

In the ten hours that followed, Venus Equilateral stock went down and down and down, passed through a deep valley, and started up again. Up it went. Up past the one hundred mark, up into the one hundred and fifties. It hovered there for a bit, and then started up again. Kingman's crowd was offering twice the market for the preferred stock, and there was little to have. It took a short-time dip at three hundred, and the few minutes of decline smoked a lot of stock out of the hands of people who looked upon this chance as the right time to make their money and get out.

Then the stock began to climb again, and those people who thought that the price had been at its peak-and-passed were angrily trying to buy in again. That accelerated the climb, but Kingman's crowd, operating on Venus and on Mars and on Terra were buying only, and selling not one share of Interplanetary Communications.

Terran Electric stock took a gradual slide, for Kingman's crowd needed additional money. But the slide was slow, and controlled, and manipulated only for the purpose of selling short. Terran Electric stock eventually remained in the hands of Kingman's crowd, though its value was lessened.

I. C. Preferred hit four hundred and sixty-eight, and hovered. It vacillated around that point for another hour, and the market closed at four hundred and sixty-nine and three-eighths.

Kingman looked at his watch and smiled. He reached forth and cut the dinning sound of the cacophony with a vicious twist of the gain knob. Silence reigned in the spaceship; grand, peaceful silence. Kingman, his nerves frayed by the mental activity and the brain-addling music-from-nowhere, took a hot shower and went to bed.

He locked the panel of the control room first, however. He wanted no engineer tinkering with his pet relay.

Cartright came into Channing's living room with a long face. "It's bad," he said. "Bad."

"What's bad?"

"Oh I, like the rest of the fools, got caught in his trap."

"Who's trap?"

"The wild man who is trying to rock Interplanetary Communications on its axis."

"Well, how?"

"They started to buy like mad, and I held out. Then the thing dropped a few points, and I tried to take a bit of profit, so that we could go on bolstering the market. They grabbed off my stock, and then, just like *that!* the market was on the way up again and I couldn't find more than a few odd shares to buy back."

"Don't worry," said Channing, "I don't think anybody is big enough to really damage us. Someone is playing fast and loose, making a killing. When this is over, we'll still be in business."

"I know, Don, but whose business will it be? Ours, or theirs?"

"Is it that bad?"

"I'm afraid so. One more flurry like today, and they'll be able to tow Venus Equilateral out and make Mars Equilateral out of it, and we won't be abe to say a word."

"Hm-m-m. You aren't beaten?"

"Not until the last drop. I'm not bragging when I say that I'm as good an operator as the next. My trouble today was not being a mind reader. I'd been doing all right, so far. I've been letting them ride it up and down with little opposition, and taking off a few here and there as I rode along. Guessing their purpose, I could count on their next move. But this banging the market sky-high has me stumped, or had me stumped for just long enough for me to throw our shirt into the ring. They took that quick—our shirt, I mean."

"That's too bad. What are you leading up to."

"There are a lot of unstable stocks that a guy could really play hob with; therefore their only reason for picking on I. C. is to gain control!"

"Pirates?"

"Something like that."

"Well," said Channing in a resigned voice, "about all we can do is to do our best and hope we are smart enough to outguess 'em. That's your job, Cartright. A long time ago I. C. made their decision concerning the executive branch of this company, and they elected to run the joint with technical men. The business aspects and all are under the control of men who know what they're fighting. We hire business men, just like business men hire engineers, and for the opposite purpose. You're the best we could get, you know that. If those guys get Venus Equilateral, they'll get you too. But if you do your best and fail, we can't shoot you in the back for it. We'll all go down together. So keep pitching, and remember that we're behind you all the way!"

"Can we float a bit of a loan?"

"Sure, if it's needed. I'd prefer Interplanetary Transport if they'll do business with us. We've been in the way of helping them out a couple of million dollar losses; they might be anxious to reciprocate."

"O. K., I have your power of attorney anyway. If I get in a real crack, I'll scream for I. T. to help. Right?"

"Right."

Cartright left, and as he closed the door, Channing's face took on a deep, long look. He was worried. He put his head between his lands and thought himself into a tight circle from which he could not escape. He did not hear Walt Franks enter behind Arden and Christine.

"Hey!" said Walt. "Why the gloom? I bear glad tidings!"

Channing looked up. "Spill," he said with a glum smile. "I could use some glad tidings right now."

"The lab just reported that that hunk of copper wire was impure. Got a couple of traces of other metals in it. They've been concocting other samples with more and less of the impurities, and Wes has been trying them as they were ready. We've got the detector working to the point where Freddy has taken the *Relay Girl* out for a run around the Station at about five hundred miles and Wes is still getting responses!"

"Is he? How can he know?"

"Charley rigged the *Relay Girl's* drivers up with a voice modulator, and Freddy is jerking his head off because the acceleration is directly proportional to the amplitude of his voice, saying: 'One, two, three, four, test.' Don, have you ever wondered why an engineer can't count above four?"

"Walt, does it take a lot of soup to modulate a driver?" asked Arden.

"Peanuts," grinned Franks. "This stuff is not like the good old radio; the power for driving the spaceship is derived mostly from the total disintegration of the cathode and the voltage applied to the various electrodes is merely for the purpose of setting up the proper field-conditions. They draw quite a bit of current, but nothing like that which would be required to lift a spaceship at 2-G for a hundred hours flat."

He turned back to Channing and said: "What's the gloom?"

Don smiled in a thoughtful fashion. "It doesn't look so bad right now. Some gang of stock market cutthroats have been playing football with Interplanetary Communications, and Cartright says he is sure that they want control. It's bad; he's been clipped a couple of hard licks, but we're still pitching. The thing I'm wondering right now is this: Shall we toss this possibility of person-to-person and ship-to-ship just at the right turn of the market to bollix up their machinations, or shall we keep it to ourselves and start up another company with this as our basis?"

"Can we screw 'em up by announcing it?"

"Sure. If we drop this idea just at the time they're trying to run the stock down, it'll cross over and take a run up, which will set 'em on their ear."

"I don't know. Better keep it to ourselves for a bit. Something may turn up. But come on down to Wes' lab and give a look at our new set-up."

Channing stood up and stretched. "I'm on the way," he said.

Farrell was working furiously on the detector device, and as they entered, he indicated the meter that was jumping up and down. Out of a speaker there was coming the full, rich tones of Freddy Thomas' voice, announcing solemnly: "One, two, three, four, test."

Wes said: "I'm getting better. Charley has been bettering his modulator now, and the detector is three notches closer to whatever this level of energy uses for resonance. Evacuation and the subsequent incandescence was the answer. Another thing I've found is this—" Farrell held up a flat disk about six inches in diameter with a sawcut from edge to center. "As you see, the color of this disk changes from this edge of the cut, varying all the way around the disk to the other side of the cut. The darned disk is a varying alloy—I've discovered how to tune the driver-radiation through a limited range. We hit resonance of the *Relay Girl's* driver system just off the end of this disk. But watch while I turn the one in the set."

Farrell took a large knob and turned it. Freddy's voice faded, and became toneless. Farrell returned the knob to its original position and the reception cleared again. "Inside of that tube there," said Farrell, "I have a selsyn turning the disk, and a small induction loop that heats the whole disk to incandescence. A brush makes contact with the edge of the disk and the axle makes the center connection. Apparently this stuff passes on a direct line right through the metal, for it works."

"Have you tried any kind of tube amplification?" asked Don.

"Not yet? Shall we?"

"Why not? I can still think that the relay tube will amplify if we hook up the input and output loads correctly."

"I've got a tube already hooked up," said Walt. "It's mounted in a panel with the proper voltage supplies and so on. If your resistance calculation is correct, we should get about three thousand voltage gain out of it."

He left, and returned in a few minutes with the tube. They busied themselves with the connections, and then Don applied the power.

Nothing happened.

"Run a line from the output back through a voltage-dividing circuit to the in-phase anode," suggested Walt.

"How much?"

"Put a potentiometer in it so we can vary the amount of voltage. After all, Barney Carroll said that the application of voltage in phase with the transmitted power is necessary to the operation of the relay tube. In transmission of D. C., it is necessary to jack up the in-phase anode with a bit of D. C. That's in-phase with a vengeance!"

"What you're thinking is that whatever this sub-level energy is, some of it should be applied to the in-phase anode?"

"Nothing but."

The cabinet provided a standard potentiometer, and as Don advanced the amount of fed-back voltage, Freddy's voice came booming in louder and louder. It overloaded the audio amplifier, and they turned the gain down as Channing increased the in-phase voltage more and more. It passed through a peak, and then Don left the potentiometer for maximum.

"Wes," he said, "call Freddy and tell him to take off for Terra, at about 4-G. Have the gang upstairs hang a ship beam on him so we can follow him with suggestions. Too bad we can't get there immediately."

"What I'm worrying about is the available gain," said Wes. "That thing may have given us a gain of a couple of thousand, but that isn't going to be enough. Not for planet-to-planet service."

"Later on we may be able to hang a couple of those things in cascade," suggested Walt.

"Or if not, I know a trick that will work—one that will enable us to get a gain of several million."

"Yeah? Mirrors, or adding machines? You can't make an audio amplifier of a three million gain."

"I know it—at least not a practical one. But, we can probably use our audio modulator to modulate a radio frequency, and then modulate the driver with the RF. Then we hang a receiver on to the detector gadget here, and collect RF, modulated, just like a standard radio transmission, and amplify it at RF, convert it to IF, and detect it to AF. Catch?"

"Sure. And that gives me another thought. It might just be possible, if your idea is possible, that we can insert several frequencies of RF into the tube and hang a number of receivers on the detector, here."

Arden laughed. "From crystal detection to multiplex transmission in ten easy lessons."

"Call Charley and have him begin to concoct an RF stage for tube-modulation," said Dan. "It'll have to be fairly low—not higher than a couple of megacycles so that he can handle it with the stuff he has available, but as long as we can hear his dulcet voice chirping that 'one, two, three, four, test,' of his, we can also have ship-to-Station two-way. We squirt out on the ship beam, and he talks back on the driver transmitter."

"That'll be a help," observed Wes. "I'd been thinking by habit that we had no way to get word back from the *Relay Girl*."

"So had I," confessed Walt. "But we'll get over that."

"Meanwhile, I'm going to get this alloy-selectivity investigated right down to the last nub," said Don. "Charley's gang can take it from all angles and record their findings. We'll ultimately be able to devise a system of mathematics for it from their analysis. You won't mind being bothered every fifteen minutes for the first week, will you, Wes? They'll be running to you in your sleep with questions until they catch up with your present level of ability in this job. Eventually they'll pass you up, and then you'll have to study their results in order to keep up."

"Suits me. That sounds like my job anyway."

"It is. O. K., Arden, I'm coming now."

"It's about time," smiled Arden.

"I wouldn't haul you away from your first love excepting that I know you haven't eaten in eight or nine hours. I've got roast knolla."

"S'long, fellows," grinned Channing. "I'm one of the few guys in the inner system who can forget that the knolla is the North Venus brother to a pussy cat."

"I could feed you pussy cat and you'd eat it if I called it knolla," said Arden. "But you wouldn't eat knolla if I called it pussy cat."

"You can't tell the difference," said Walt.

"Tell me," asked Wes, "what does pussy cat taste like?"

"I mean by visual inspection. Unfortunately, there can be no comparison drawn. The Venusians will eat pussy cat, but they look upon the knolla as a household pet, not fit for Venusian consumption. So unless we revive one of the Ancient Martians, who may have the intestinal fortitude—better known as guts—to eat both and describe the difference, we may never know," offered Walt.

"Stop it," said Arden, "or you'll have my dinner spoiled for me."

"All the more for me," said Don. "Now, when I was in college, we cooked the dean's cat and offered it to some pledges under the name of knolla. They said—"

"We'll have macaroni for dinner," said Arden firmly. "I'll never be able to look a fried knolla in the pan again without wondering whether it caterwauled on some back fence in Chicago, or a Palanortis Whitewood on Venus."

She left, and Channing went with her, arguing as he went to the effect that she should develop a disregard for things like their discussion. As a matter of interest, Channing had his roast knolla that evening, so he must have convinced Arden.

Walt said: "And then there were three. Christine, has our little predinner talk disturbed your appetite?"

"Not in the least," said the girl stoutly. "I wouldn't care whether it was knolla or pussy cat. I've been on Mars so long that either one of the little felines is alien to me. What have you to offer?"

"We'll hit Joe's for dinner, which is the best bar in sixty million miles today. Later we may take in the latest celluloid epic, and then there will be a bit of mixed wrestling in the ballroom."

"Mixed wres— Oh, you mean dancing. Sounds interesting. Now?"

"Now. Wes, what are you heading for?"

"Oh, I've got on a cockeyed schedule," said Wes. "I've been catching my sleep at more and more out-of-phase hours until this is not too long after breakfast for me. You birds all speak of 'Tomorrow,' 'Today' and 'Yesterday' out here, but this business of having no sun to come up in the morning, and the electric lights running all the time has me all bollixed up."

"That daily nomenclature is purely from habit," said Walt. "As you know, we run three equal shifts of eight hours each, and therefore what may be 'Morning' to Bill is

'Noon' to James and 'Night' to Harry. It is meaningless, but habitual to speak of 'Morning' when you mean 'Just after I get up!' Follow me?"

"Yup. This, then, is morning to me. Run along and have fun."

"We'll try," said Walt.

"We will," said Christine.

Farrell grinned as they left. He looked at Walt, and said: "You will!"

Walt wondered whether he should have questioned Wes about that remark, but he did not. Several hours later, Walt wondered how Wes could have been so right.

Interplanetary Communications, Preferred, started in its long climb as soon as the markets opened on the following day. Cartright, following his orders and his experience, held onto whatever stock he had, and bought whatever stock was tossed his way. Several times he was on the verge of asking Interplanetary Transport for monetary assistance, but the real need never materialized.

Kingman alternately cursed the whining music and cheered the pyramiding stock. About the only thing that kept Kingman from going completely mad was the fact that the alien music was not continuous, but it came and went in stretches of anything from five to fifty minutes, with varied periods of silence in between selections.

Up and up it went, and Kingman was seeing the final, victorious coup in the offing. A week more, and Venus Equilateral would belong to Terran Electric. The beam from Terra was silent, save for a few items of interest not connected with the market. Kingman's men were given the latest news, baseball scores, and so forth, among which items was another message to Channing from the solar beam project engineer, Addison. They had about given up. Nothing they could do would prevent the formation of ozone by the ton as they

drew power by the kilowatt from Sol.

On Venus Equilateral, Channing said: "Ask Charley what his radio frequency is."

Ten minutes later, at the speed of light, the ship beam reached the *Relay Girl* and the message clicked out. Charley Thomas read it, and spoke into the microphone. The *Relay Girl* bucked unmercifully, as the voice amplitude made the acceleration change. Then at the speed of light, squared, the answer came back in less than a twinkle.

"Seventeen hundred kilocycles."

Channing began to turn the tuner of the radio receiver. The band was dead, and Channing laughed. "This is going to be tricky, what with the necessity of aligning both the driver-alloy disk and the radio receiver. Takes time."

He changed the alloy disk in minute increments, and waved the tuner across that portion of the band that would most likely cover the experimental error of Charley Thomas' frequency measurement. A burst of sound caught his ear, was lost for a moment, and then swelled into perfect tune as Don worked over the double tuning system.

"Whoa, Tillie," said Walt. "That sounds like—"

"Like hell."

"Right. Just what I was going to say. Is it music?"

"Could be. I've got a slightly tin ear, you know."

"Mine is fair," said Walt, "but it might as well be solid brass as far as this mess is concerned. It's music of some kind, you can tell it by the rhythm. But the scale isn't anything like I've heard before."

"Might be a phonograph record played backward," suggested Wes.

"I doubt it," said Channing seriously. "The swell of that orchestra indicates a number of instruments—of some cockeyed kind or other—the point I'm making is that anything of a classical or semiclassical nature played backwards on a phonograph actually sounds passable. I can't say the same for jamstead music, but it holds for most of the classics, believe it or not. This sounds strictly from hunger."

"Or hatred. Maybe the musicians do not like one another."

"Then they should lambaste one another with their instruments, not paste the sub-ether with 'em."

Channing lit a cigarette. "Mark the dial," he said. "Both of 'em. I've got to get in touch with the Thomas Boys."

Walt marked the dials and tuned for the *Relay Girl*. He found it coming in not far from the other setting. Charley was speaking, and they tuned in near the middle of his speech.

"—this thing so that it will not buck like a scenic railway finding the fourth derivative of space with respect to time. For my nontechnical listeners, that is none other than the better known term: Jerkiness. We applied the modulation in to the first driver anode—the little circular one right above the cathode. I don't know whether this is getting out as it should, so I'm going to talk along for the next fifteen minutes straight until I hear from you. Then we're switching over and repeating. Can you hear me?"

Channing cut the gain down to a whisper and put a message on the beam, confirming his reception. Ten minutes later, Charley changed his set speech, and said: "Good! Too bad we haven't got one of those receivers here, or we could make this a two-way with some action. Now listen, Don. My idiot brother says he can make the beam transmit without the drive. Unfortunately, I am not a driver expert like he is and so I can not remonstrate with the half-wit. So, and right now, we're cutting the supply voltage to the final focusing anode. Whoops! I just floated off the floor and the mike cable is all tangled up in my feet. This free stuff is not as simple as the old fiction writers claimed it was. Things are floating all over the place like mad. The accelerometer says exactly zero, and so you tell me if we are getting out. We're going back on 1-G so that we can sit down again. That's better! Though the idiot—it's a shame to be forced to admit that one of your family is half-witted—didn't wait until we were in position to fall. I almost landed on my head—which is where he was dropped as an infant. How was it? Did you hear my manly voice whilst we were going free? Say 'No' so that my idiot brother will not have anything to say about his brilliant mind. I'm out of breath and we're going back on that home recording of Freddy saying, and I will let him quote, via acetate."

The sound of a phonograph pickup being dropped on a record preceded Freddy's voice saying: "One, two, three, four, test. One—"

Channing cut the gain again. "That red-hot. I thought he was talking all this time."

"Not the Thomas Boys. That comes under the classification of 'Work' which they shun unless they can not get any kind of machine to do it for them," laughed Walt.

Walt turned the dials back to the unearthly symphony. "At C^2, that might come from Sirius," he said, listening carefully. "Sounds like Chinese."

"Oh, now look," objected Don. "What off earth would a Chinese Symphony be doing with a driver-modulator system?"

"Broadcasting—"

"Nope. The idea of detecting driver radiation is as old as the hills. If any culture had uncovered driver-beam transmission, we'd all have been aware of it. So far as I know, we, and the Terran Electric crowd are the only ones who have had any kind of an opportunity of working with this sub-etheric energy. Wes, have you another miniature of the relay tube handy?"

"Sure. Why?"

"I'm going to see if this stuff can be made directional. You're bringing whatever it is into the place on a collector plate and slamming it into an input-terminal power transmission tube. It goes across the table to the relay tube, and is amplified, and then is tossed across more table to the load-terminal tube, where the output is impressed across your alloy-disk. Right?"

"Right."

"I want another relay tube. I'm going to use it for a directional input-beam, aligning it in the same way that Jim Baler and Barney Carroll did their first find. The one that sucked power out of the electric light, turned off the city hall, and so on. Follow?"

"Perfectly. Yes, I've got a couple of them. But they're not connected like Walt's set-up was."

"Well, that three-tube system was built on sheer guesswork some time ago. We can tap in the relay tube and haul out a set of cables that will energize the first relay tube. Hang her on gymbals, and we'll go hunting."

"Shall I have Freddy return?"

"Yes. We'll have Walton's gang build us up about six of these things just as we have here."

"That won't take long," said Walt. "They're working on the tuning disks now, and we should have 'em by the time that Freddy gets back here."

"But this wild and woolly music. It's alien!"

Wes turned from the teletype and dug in the cabinet for the extra relay tube. He up-ended the chassis containing Walt's set-up, and began to attach leads to the voltage supply, cabling them neatly and in accordance with the restrictions on lead-capacities that some of the anodes needed.

"It's alien," said Wes in agreement. "I'm going to shut it off now whilst I tinker with the tube."

"Wait a minute," said Don. "Here comes Jim. Maybe he'd like to hear it."

"Hear what?" asked Jim Baler, entering the door.

"We've a Sirian Symphony," explained Don, giving Jim the background all the way up to the present time. Jim listened, and then said:

"As an engineer, I've never heard anything like that in my life before. But, as a student of ancient languages and arts and sciences, I have. That's Chinese."

"Oh no!"

"Oh yes. But definitely."

"Ye gods!"

"I agree."

"But how—where—"

"And/or when?"

Channing sat down hard. He stared at the wall for minutes. "Chinese. Oh, great, slippery, green, howling catfish!" He picked up the phone and called the decoupler room where the messages were sorted as to destination upon their entry into the Station.

"Ben? Look, have we a ship beam on anything of Chinese registry?"

Ben said wait a minute while he checked. He returned and said: "Four. *The Lady of Cathay, The Mandarin's Daughter, The Dragoness,* and *The Mongol Maid.* Why?"

Put a ship message on each of 'em, asking whether they have any Chinese music aboard."

"And then what? They can't

answer.”

“Make this an experimental request. If any of them are using any recordings of Chinese music, tell them to have their electronics chief replace the phonograph pickup with a microphone—disturbing absolutely nothing—and to reply as if we could hear them. Get me?”

“Can you? Hear ’em, I mean.”

“We hear something, and Jim says it’s Chinese.”

“It’s worth a try, then. See you later.”

“Will they?” asked Jim, interested in the workings of this idea.

“Sure. Ever since we steered the *Empress of Kolain* out of the grease with the first Station-to-ship beam, all three of the interplanetary companies have been more than willing to co-operate with any of our requests as long as we precede the message with the explanation that it is experimental. They’ll do anything we ask ’em to, short of scuttling the ship.”

“Nice hookup. Hope it works.”

“So do I,” said Wes. “This, I mean. I’ve got our directional gadget hooked up.”

“Turn it on.”

The wailing of the music came in strong and clear. Wes turned the input tube on its support, and the music passed through a loud peak and died off on the far side to almost zero. Wes adjusted the mobile tube for maximum response and tightened a small set-screw. “It’s a shame we haven’t got a nice set of protractors and gymbals,” said Wes. “I had to tear into the desk lamp to get that flexible pipe.”

“Small loss. She’s directional, all right. We’ll get the gymbals later. Right now I don’t want this turned off because we may hear something interesting— Whoops, it went off by itself!”

“Could we dare to hope?” asked Walt.

“Let’s wait. They’ll have to hitch the microphone on—”

“Give ’em a half hour, at least.”

Twenty minutes later, a strange voice came through the speaker. “Dr. Channing, of Venus Equilateral? We have been contacted by your organization with respect to the possibility of your being able to hear the intership communicator system. This seems impossible, but we are not ones to question. The fact that you are in possession of the facts concerning our love of the music of our ancestors is proof enough that you must have heard something. I presume that further information is desired, and I shall wait for your return. This is Ling Kai Chaing, Captain of the *Lady of Cathay*.”

“We got it!” chortled Don. He did a war dance in the lab, and the rest followed suit. Bits of wire and oddments of one sort or another filled the air as the big, grown-up men did a spring dance and strewed the floor with daintily thrown junk. At the height of the racket, Arden and Christine entered —no, they were literally hauled in, completely surrounded, and almost smothered.

Arden fought herself free and

said: "What's going on?"

"We've just contacted a ship in space."

"So what? Haven't we been doing that for months?"

"They've just contacted us, too!"

"Huh?" asked Arden, her eyes widening.

"None other. Wait, I'll get an answer." Don contacted Ben, in the decoupler room and said: "Ben, hang this line on the *Lady of Cathay's* beam, will you?"

"Is that her?"

"None other."

"Go ahead. She's coupled."

Don pecked out a message. "Please describe the intercommunication system used by your ship in detail. We have heard you, and you are, therefore, the first ship to contact Venus Equilateral from space flight. Congratulations."

Eight minutes later, the voice of Captain Chaing returned.

"Dr. Channing, I am handing the microphone over to Ling Wey, our electronics engineer, who knows the system in and out. He'll work with you on this problem."

Ling Wey said: "Hello. This is great. But I'm not certain of how it's done. The output of the phono system is very small, and certainly not capable of putting out the power necessary to reach Venus Equilateral from here. However, we are using a wired-radio system at seventeen hundred and ninety kilocycles in lieu of the usual cable system. The crew all like music, and, therefore, we play the recordings of our ancestral musicians almost incessantly."

He paused for breath, and Channing said: "Walt, tap out a message concerning the lead-length of the cables that supply the driver anodes. Have him check them for radio frequency pick-up."

"I get it." The 'type began to click.

This communication was carried on for hour after hour. Don's guess was right, it turned out; the lead that connected the first driver anode was tuned in wave length to almost perfect resonance with the frequency of the wired-radio communicator system. Channing thanked them profusely, and they rang off. Soon afterward the wailing, moaning music returned to the air.

"Wonder if we could get that without the radio," said Don.

"Don't know. We can pack the juice on in the amplifier and see, now that we have it tuned on the button," said Walt.

"It won't," said Wes. "I've been all across the dial of the alloy disk. Nothing at all."

"O. K. Well, so what if it doesn't. We've still got us a ship-to-ship communications system. Hey! What was that?"

That was a pale, flat-sounding human voice saying: "Kingman! I. C. Pfd. has been at six hundred and nine for two days, now. What's our next move?"

"Kingman!" exploded Channing. "Why, the . . . the—"

"Careful," warned Arden. "There's a lady present."

"Huh?"

"Her," said Arden pointing at Christine.

"Wait," said Walt. "Maybe he'll answer."

Don fiddled with the dials for a full fifteen minutes, keeping them very close to the spot marked, hoping that Kingman's answer might not be too far out of tune. He gave up as the answer was not to be found, and returned to the original setting. Ten minutes later the voice said: "Kingman, where in the devil is my answer? I want to know what our next move is. There isn't a bit of V. E. stock available. Why don't you answer?"

Then, dimly in the background, a voice spoke to the operator of the instrument. "Kingman's probably asleep. That terrible moaning-stuff he's been complaining about makes him turn the thing off as soon as the day's market is off. He—and the rest of that crew—can't stand it. You'll have to wait until tomorrow's market opens before he'll be listening."

"O. K.," said the operator, and the set went silent.

"Kingman!" said Don Channing in a low, hard voice. "So he's the bright guy behind this. I get it now. Somehow he discovered a detector, and he's been playing the market by getting the quotations by sub-etheric transmission at C^2 and beating the Northern Landing market. And did you get the latest bit of luck? Kingman still is unaware of the fact that we are onto him—and have perfected this C^2 transmission. Here's where he gets caught in his own trap!"

"How?"

"We're not in too bad shape for making good, honest two-ways out of this sub-ether stuff. Kingman is still behind because he hasn't got a return line back to Terra—he must be using our beams, which gives us a return edge."

"Why not get him tossed into the clink?" asked Walt.

"That's practical. Besides, we're sitting in a great big pile of gravy right now. We can prove Kingman has been violating the law to embezzle, mulct, steal, commit grand larceny, and so on. We're going to take a swing at Mr. Kingman and at Terran Electric that they won't forget. We can't lose, because I'm not a good sportsman when I find that I've been tricked. We're going after Kingman in our own fashion—and if we lose, we're going to go tinhorn and cry for the gendarmes. I'm not proud."

"What do you plan?"

"We'll put a horde of folks on the decoupler files with the code Terran Electric filed with the government office. We can get the code, and I'm of the opinion that Kingman wouldn't take time to figure out a new code, so he'll be using the old one. As soon as we find a message in that code that is either addressed to Terran Electric or pertains to I. C. Preferred stock, we'll start to intercept all such messages and use 'em for our own good."

"That's illegal."

"Yup. But who's gonna holler? Kingman can't."

"But suppose we lose—?"

"Kingman will not know we've been tricking him. Besides, we can't lose with two ways to get ahead of his one. Come on, fellows, we've got to help get the extra receivers together."

"How are we going to cut through the Channing Layer?"

"Easy. That's where we'll use the relay stations at Luna, Deimos, and the six portables that circle Venus."

"I get it. O. K., Don, let's get to work."

"Right. And we'd better leave a guy here to collect any more interesting messages from Kingman's crowd. We can tune it right on to Kingman's alloy, and that'll make that music take the back seat. We need narrower selectivity."

"Charley's gang will find that if it is to be found," smiled Walt. "We're really on the track this time."

A dead-black spaceship drifted across the face of Luna slowly, and its course, though apparently aimless, was the course of a ship or a man hunting something. It darted swiftly, poised, and then zigzagged forward, each straight-side of the jagged course shorter than the one before. It passed over a small crater and stopped short.

Below, there was a spaceship parked beside a driver tube anchored in the pumice.

The black ship hovered above the parked ship, and then dropped sharply, ramming the observation dome on top with its harder, smaller bottom. The two ships tilted and fell, crushing the ground near the poised driver tube. Space-suited men assaulted the damaged ship, broke into the bent and battered plates and emerged with three men who were still struggling to get their suits adjusted properly.

Channing's men took over the poised driver tube, and in their own ship, Walt spoke over a subether radio of a different type.

"Don, we got him."

Don answered from Venus Equilateral, and his voice had no more delay than if he had been within a hundred yards of the crater on Luna.

"Good. Stay there; you can contact the Lunar Relay Station from there. Wes is all ready on Station 3 above Northern Landing with his set, and Jim Baler is at the Deimos Station."

"Hi, Walt," came Wes' voice.

"Hi," said Jim Baler.

"Hello, fellows," said Walt. "Well, what cooks?"

"Kingman," said Channing. "You've got your orders, Walt. When Kingman expects the market to go down, tell him it's still going up. We'll figure this out as we go along, but he won't like it at all."

There was silence for a few minutes, and then Don said: "Walt, Kingman's sent a message through the Northern Landing station now. He says: 'Dump a block to shake the suckers loose. This is pyramided so high that they should all climb on the sell-wagon; running the market down of their own weight. When it hits a new low, we'll buy, and this time end up by having control.' When he starts to run the market down, you buy at Terra."

Minutes later, the message hit the Terra market, and Kingman's agent started to unload. The stock started off at six hundred and nine, and it soon dropped to five-forty. It hovered there, and then took another gradual slide to four-seventy. Then a message came through the regular beam station which Walt intercepted, decoded with Terran Electric's own code book, and read as follows:

"I. C. Preferred coming in fast. Shall we wait?"

Walt chuckled and spoke into the driver modulator. "Kingman," he said, "some wiseacre is still buying. I. C. Preferred is running at seven-ninety! What now?"

In the Venus Equilateral radio, he said: "Don, I just fixed him."

From Venus, Wes said: "You sure did. He's just giving orders to drop some more stock. This is too dirty to be funny, but Kingman asked for it. I know him. He's got this set up so that no one can do a thing on this market program without orders from him. Too bad we can't withhold the Northern Landing quotations from him."

The Lunar Beam brought forth another message intended for Kingman's interceptor at Luna. "I. C. Preferred is dropping like a plummet. When can we buy?"

Walt smiled and said into Kingman's set-up: "Kingman! I. C. Preferred is now at eight hundred and seventy!"

Not many minutes later, Wes said: "That was foul, Walt. He's just given orders to run the market down at any cost."

"O. K.," said Walt. "But he's going to go nuts when the Northern Landing Exchange starts down without ever getting to that mythical nine hundred."

"Let him wonder. Meanwhile, fellows, let's run ourselves a slide on Terran Electric. Sell the works!"

Terran Electric started down just as I. C. Preferred took its third drop. It passed three hundred, and started down the two hundred numbers. Walt shook his head and said to Kingman: "Kingman, we're getting results now. She's dropped back again—to six hundred and three." Then he said: "Kingman, someone is playing hob with T. E. Preferred. She's up to two hundred and fifty-one."

To Don, Walt said: "Good thing that Kingman has that Sinese Chimphony for a bit of mood music, or he'd recognize my voice."

"Which way will he jump?" laughed Don. "That was a slick bit of Kingman-baiting, Walt, in spite of your voice."

"Kingman's taking it hard," said Wes. "He says to drop some of his own stock so that they can use the money to manipulate the I. C. stuff."

"O. K.," said Jim Baler. This looks like a good time to think about buying some of Kingman's stuff. Right?"

"Wait until his sales hit bottom," said Don. "Walt, tip us off."

"O. K. What now?"

"Wait a bit and see."

Terran Electric went down some more, and then Jim said: "Now?"

"Now," answered Don. "You too, Wes."

"Me too?" asked Walt.

"You continue to sell!"

"Oh-oh," said Wes. "Kingman is wild. He wants to know what's the matter with the market."

"Tell him that your end is all right, and that I. C. Preferred is still going down, but steady."

"O. K.," said Walt.

The hours went by, and Kingman became more and more frantic. I. C. Preferred would be reported at five hundred, but the Northern Landing Exchange said two-ten. Meanwhile, Terran Electric—

"Oh, lovely," said Don. "Beautiful. We've got us a reciprocating market now, better than Kingman's. When she's up at Terra, they're down at Canalopsis and Northern Landing—and vice versa. Keep it pumping, boys, and we'll get enough money to buy Kingman out."

The vacillating market went on, and Don's gang continued to rock the Terran Electric stock. Then as the market was about to close for the day, Don said: "Sell 'em short!"

Terran Electric stock appeared on the market in great quantities. Its value dropped down and down and down, and Kingman, appraised of the fall by Walt, who magnified it by not less than two to one, apparently got frantic again, for he said:

"We're running short. Drop your Terran stock to bolster the I. C. job!"

"Oh, lovely," said Don.

"You said that."

"I repeat it. Look, fellows, gather all the T. E. Preferred and I. C. Preferred you can. Walt, tell him that Terran Electric is dropping fast, so he'll scuttle more of his stuff, and we'll pick it up slowly enough so that we won't raise the market. How're we fixed for I. C. Preferred?"

"Not too bad. Can we hit him once more?"

"Go ahead," said Don.

"Kingman," said Walt. "Kingman! Hell's loose. The Interplanetary Bureau of Criminal Investigations has just decided to look into the Interplanetary Communications angle. They want to know who's trying to grab control of a public carrier!"

Minutes later, Wes said: "Oh, Brother Myrtle. That did it. He just gave orders to drop the whole thing short!"

"Wait until I. C. Preferred hits a new low and then we'll buy," said Don.

The flurry dropped I. C. Preferred to forty-seven, and then the agents of Venus Equilateral stepped forth and offered to buy, at the market, all offered stock.

They did.

Then, as no more stock was offered, Interplanetary Communications Preferred rose sharply to ninety-four and stabilized at that figure. Terran Electric stock went through a valley, made by Kingman's sales, and then headed up, made by purchases on Terra, on Mars, and on Venus.

Don said: "Look, fellows, this has gone far enough. We have control again, and a goodly hunk of Terran Electric as well. Enough, I think, to force them to behave like a good little company and stay out of other people's hair. Let's all get together and celebrate."

"Right," echoed the men.

A month later, Joe's was the scene of a big banquet. Barney Carroll stood up and said:

"Ladies and gentlemen, we all know why we're here and what we're celebrating. So I won't have to recount the whole affair. We all think Don Channing is a great guy, and Walt Franks is not far behind, if any. I'm pretty likable myself, and my lifelong sparring partner Jim Baler is no smelt, either. And so on, ad infinitum.

"But, ladies and gentlemen, Don Channing has a dark, deep, dire, desperate phase of his life, one that he will be remembered and cursed for; one that will weigh about his neck like a milestone—or is it millstone?—for all his life.

"Benefactor though he is, this much you shall know; I still say that there is no place in the inner system for a man who has made this possible. Listen!"

Barney raised his hand, and an attendant turned a standard, living room model radio receiver on. It burst into sound immediately.

"Ladies and gentlemen, the Interplanetary Network now brings to you the Whitewood Nutsies Program. Karven and Norwal, the Venusian Songbirds; Thalla; and Lillas, in person, coming to you from the jungles of Palanortis, on Venus, by courtesy of the Interplanet Foods Co. of Battle Creek, Michigan!

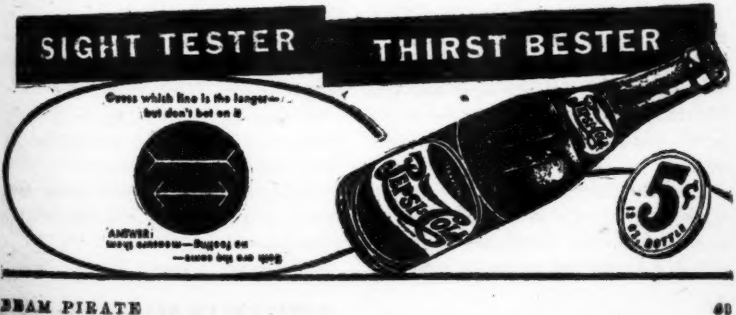
"Ladies and gentlemen, Whitewood Nutsies are *GOOD* for you—"

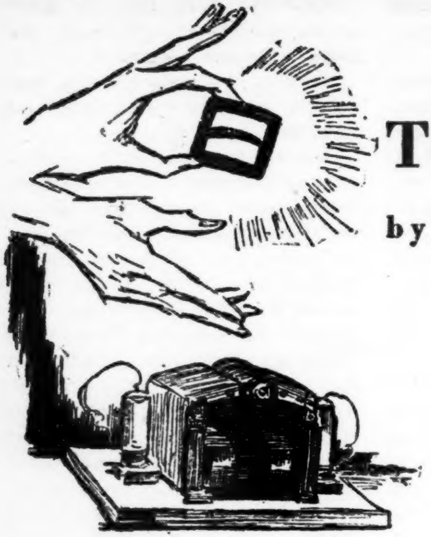
Walt Franks said to Christine: "Let's get out of here."

Christine inspected Walt carefully. Then nodded. "Yup," she grinned. "Even you sound better than the Interplanetary Network!"

For once, Walt did not argue, having gained his point.

THE END.


SIGHT TESTER
THIRST BESTER
Guess which line is the longer—but don't bet on it
ANSWER: Both are the same—Surprised eh?
Pepsi-Cola
Pepsi-Cola
5¢
12 OZ. BOTTLE



The Wedge

by ISAAC ASIMOV

Gold's funny stuff. Perfectly useless, so far as practical work goes, but the men of the Foundation could make it do things in the psychological-political field.

Illustrated by Kramer

"Never let your sense of morals prevent you from doing what is right!" —*Salvor Hardin*

Lathan Devers was completely a-lather when the call reached his receiver—which proves that the old bromide about telemessages and the bathtub holds true even in the dark, hard space of the Galactic Periphery.

Luckily that part of a free-lance trade ship which is not given over to miscellaneous merchandise is extremely snug. So much so, that the shower, hot water included, is located in a two-by-four cubby, ten feet from the control panels. Devers heard the staccato rattle of the receiver quite plainly.

Dripping suds and a curse, he stepped out to adjust the vocal, and three hours later a second trade ship was alongside, and a grinning youngster entered through the air tube between the ships.

Devers rattled his best chair forward and perched himself on the pilot-swivel.

"What've you been doing,

Gorm?" he asked, darkly. "Chased me all the way from the Foundation?"

Les Gorm broke out a cigarette, and shook his head definitely, "Me? Not a chance. I'm just the sucker who happened to land on Glyptal IV the day after the mail. So they sent me out after you with this."

The tiny, gleaming sphere changed hands, and Gorm added, "It's confidential. Super-secret. Can't be trusted to the sub-ether, and all that. Or so I gather. At least, it's a Personal Capsule, and won't open for anyone but you."

Devers regarded the capsule distastefully, "I can see that. And I never knew one of these to hold good news, either."

It opened in his hand and the thin, transparent tape unrolled stiffly. His eyes swept the message quickly, for when the last of the tape had emerged, the first was already brown and crinkled. In a minute and a half it had turned black and, molecule by molecule, fallen apart."

Devers grunted hollowly, "Oh, *Galaxy!*"

Les Gorm said quietly, "Can I help somehow? Or is it too secret?"

"It will bear telling, since you're of the Guild. I've got to go to Askone."

"That place? How come?"

"They've imprisoned a trader. But keep it to yourself."

Gorm's expression jolted into anger, "Imprisoned! That's against the Convention."

"So is interference with local politics."

"Oh! Is that what he did?" Gorm meditated. "Who's the trader? Anyone I know?"

"No!" said Devers sharply, and Gorm accepted the implication and asked no further questions.

Devers was up and staring darkly out the visiplate. He mumbled strong expressions at that part of the misty lens-form that was the body of the Galaxy, then said loudly, "Damnedest mess! I'm way behind quota."

Light broke on Gorm's intellect, "Hey, friend, Askone is a closed area."

"That's right. You can't sell as much as a penknife on Askone. They won't buy atomic gadgets of *any* sort. With my quota dead on its feet, it's murder to go there."

"Can't get out of it?"

Devers shook his head absently, "I know the fellow involved. Can't walk out on a friend. What of it? I am in the hands of the Galactic Spirit, and walk cheerfully in the way he points out."

Gorm said blankly, "Huh?"

Devers looked at him, and laughed shortly, "I forgot. You never read the 'Book of the Spirit,' did you?"

"Never heard of it?" said Gorm, curtly.

"Well, you would if *you'd* had a religious training."

"Religious training? For the *priesthood?*" Gorm was profoundly shocked.

"Afraid so. It's my dark shame and secret. I was too much for the Revered Fathers, though. They expelled me, for reasons sufficient to promote me to a secular education under the Foundation. Well, look, I'd better push off. How's your quota this year?"

Gorm crushed out his cigarette and adjusted his cap, "I've got my last cargo going now. I'll make it."

"Lucky fellow," gloomed Devers, and for many minutes after Les Gorm left, he sat in motionless reverie.

So Eskel Gorov was on Askone—and in prison as well!

That was bad! In fact, considerably worse than it might appear. It was one thing to tell a curious youngster a diluted version of the business to throw him off and send him about his own. It was a thing of a different sort to face the truth.

For Lathan Devers was one of the few people who happened to know that Master Trader Eskel Gorov was not a trader at all; but that entirely different thing, an agent of the Foundation!

Two weeks gone! Two weeks wasted.

One week to reach Askone, at the extreme borders of which the vigilant warships speared out to meet him in converging numbers. Whatever their detection system was, it worked—and well.

They sidled him in slowly, without a signal, maintaining their cold distance, and pointing him harshly towards the central sun of Askone.

Devers could have handled them at a pinch. Those ships were holdovers from the dead-and-gone Galactic Empire—but they were sports cruisers, not warships; and without atomic weapons, they were so many picturesque and impotent ellipsoids. But Askel Gorov was a prisoner in their hands, and Gorov was not a hostage to lose. The Askonians must know that.

And then another week—a week to wind a weary way through the clouds of minor officials that formed the buffer between the Grand Master and the outer world. Each little sub-secretary required soothing and conciliation. Each required careful and nauseating milking for the flourishing signature that was the pathway to the next official one higher up.

For the first time, Devers found his trader's identification papers useless.

Now the Grand Master was on the other side of the guard-flanked, gilded door—and two weeks had gone.

Gorov was still a prisoner and Devers' cargo rotted useless in the holds of his ship.

The Grand Master was a small man; a small man with a balding head and very wrinkled face, whose body seemed weighed down to motionlessness by the huge, glossy fur collar about his neck.

His fingers moved on either side, and the line of armed men backed away to form a passage, along which Devers strode to the foot of the Chair of State.

"Don't speak," snapped the Grand Master, and Devers' opening lips closed tightly.

"That's right," the Askonian ruler relaxed visibly. "I can't en-dire useless chatter. You cannot threaten and I won't abide flattery. Nor is their room for injured complaints. I have lost count of the times you wanderers have been warned that your devil's machines are not wanted anywhere in Askone."

"Sir," said Devers, quietly, "there is no attempt to justify the trader in question. It is not the policy of traders to intrude where they are not wanted. But the Galaxy is great, and it has happened before that a boundary has been trespassed unwittingly. It was a deplorable mistake."

"Deplorable, certainly," squeaked the Grand Master. "But mistake? Your people on Glyptal IV have been bombarding me with pleas for negotiation since two hours after the sacreligious wretch was seized. I have been warned by them of your own coming many times over. It seems a well-organized rescue campaign. Much seems to have been anticipated—a little too much for mistakes, deplorable or otherwise."

The Askonian's black eyes were scornful. He raced on, "And are you traders, flitting from world to world like mad little butterflies, so mad in your own right that you can land on Askone's largest world, in the center of its system, and consider it an unwitting boundary mix-up. Come, surely not."

Devers winced without showing it. He said, doggedly, "If the attempt to trade was deliberate, your veneration, it was most injudicious and contrary to the strictest regulations of our Guild."

"Injudicious, yes," said the Askonian, curtly. "So much so, that your comrade is likely to lose life in payment."

Devers' stomach knotted. There was no irresolution there. He said, "Death, your veneration, is so absolute and irrevocable a phenomenon that certainly there must be some alternative."

There was a pause before the guarded answer came, "I have heard that the Foundation is rich."

"Rich? Certainly. But our riches are that which you refuse to take. Our atomic goods are worth—"

"Your goods are worthless in that they lack the ancestral blessing. Your goods are wicked and accursed in that they lie under the ancestral interdict." The sentences were intoned; the recitation of a formula.

The Grand Master's eyelids dropped, and he said with meaning, "You have nothing else of value?"

The meaning was lost in the trader, "I don't understand. What is it you want?"

The Askonian's hands spread apart, "You ask me to trade places with you, and make known to you *my* wants. I think not. Your colleague, it seems, must suffer the punishment set for sacrilege by the Askonian code. Death by gas. We are a just people. The poorest peasant, in like case, would suffer no more. I, myself, would suffer no less."

Devers mumbled hopelessly, "Your veneration, would it be permitted that I speak to the prisoner?"

"Askonian law," said the Grand Master coldly, "allows no communication with a condemned man."

Mentally, Devers held his breath, "Your veneration, I ask you to be merciful towards a man's soul, in the hour when his body stands forfeit. He has been separated from spiritual consolation in all the time that his life was in danger. Even now, he faces the prospect of going unprepared to the bosom of the Spirit that rules all."

The Grand Master said slowly and suspiciously, "You are a Tender of the Soul?"

Devers dropped a humble head, "I have been so trained. In the empty expanses of space, the wandering traders need men like myself to care for the spiritual side of a life so given over to commerce and worldly pursuits."

The Askonian ruler sucked thoughtfully at his lower lip. "Every man should prepare his soul for his journey to his ancestral spirits. Yet I had never thought you traders to be believers."

Eskel Gorov stirred on his couch and opened one eye as Lathan Devers entered the heavily-reinforced door. It boomed shut behind him. Gorov sputtered and came to his feet.

"Devers! They sent you?"

"Pure chance," said Devers, bitterly, "or the work of my own personal malevolent demon. Item one, you get into a mess on Askone. Item two, my sales route, as known to the Board of Trade, carries me within fifty parsecs of the system at just the time of item one. Item three, we've worked together before and the Board knows it. Isn't that a sweet, inevitable set-up? The answer just pops out of a slot."

"Be careful," said Gorov, tautly. "There'll be someone listening. Are you wearing a Field Distorter?"

Devers indicated the ornamented bracelet that hugged his wrist and Gorov relaxed.

Devers looked about him. The cell was bare, but large. It was well-lit and it lacked offensive odors.

He said, "Not bad. They're treating you with kid gloves."

Gorov brushed the remark aside, "Listen, how did you get down here? I've been in strict solitary for almost two weeks."

"Ever since I came, huh? Well, it seems the old bird who's boss here has his weak points. He leans toward pious speeches, so I took a chance that worked. I'm here in the capacity of your spiritual adviser. There's something about a pious man, who will cheerfully cut your throat when it suits him, you know, that creates an ingrained reluctance to endanger the welfare of your soul. It's just a piece of empirical psychology. A trader has to know a little of everything."

Gorov's smile was sardonic, "And you've been to theological school as well. You're all right, Devers. I'm glad they sent you. But the Grand Master doesn't love my soul exclusively. Has he mentioned a ransom?"

The trader's eyes narrowed, "He hinted—barely. And he also threatened death by gas. I played safe, and dodged; it might easily have been a trap. So it's extortion, is it? What is it he wants?"

"Gold."

"Gold!" Devers frowned. "The metal itself? What for?"

"It's their medium of exchange."

"Is it? And where do I get gold from?"

"Wherever you can. Listen to me; this is important. Nothing will happen to me as long as the Grand Master has the scent of gold in his nose. Promise it to him; as much as he asks for. Then go back to the Foundation, if necessary, to get it. When I'm free, we'll be escorted out of the system, and then we part company."

Devers stared disapprovingly, "And then you'll come back and try again."

"It's my assignment to sell atomics to Askone."

"They'll get you before you've gone a parsec in space. You know that, I suppose."

"I don't," said Gorov. "And if I did, it wouldn't affect things."

"They'll kill you the second time."

Gorov shrugged.

Devers said quietly, "If I'm going to negotiate with the Grand Master again, I want to know the whole story. So far, I've been working it too blind. As it was, the few mild remarks I did make almost threw his veneration into fits."

"It's simple enough." Gorov spoke rapidly, and in a whisper. "Here it is. The Foundation is creating a commercial empire here in the Periphery. The foreign policy revolves about that. We are the only source of atomic power available except for such relics of the old Empire as still exist. Every system then, whose economic backbone we can convert from chemical and mechanical energy to atomic energy becomes totally dependent upon us."

Devers was nodding, "That I realize. I'm a trader."

"Right. And that's your reason for existence. Organized trade for the Foundation at present can exist only with worlds relatively near. You traders are the outposts, the wandering peddlers, that reach regions we couldn't otherwise for centuries, perhaps. You're wedges, understand. You introduce gadgets, little atomic doodads, that open the way, increase the desire, whet the appetite."

The trader grinned, "Stop. You're breaking my heart."

"It's so!" Gorov was not grinning. "And, conversely, going back to the argument, any system that refuses to accept atomic gadgets is dangerous to us—"

"Because such a system can never be under our economic domination?"

"*And* because it can act as a focal point for hostility."

"All right, then," said Devers, "so much for theory. Now what exactly prevents the sale. Religion? The Grand Master implied as much."

"It's a form of ancestor worship. Their traditions tell of an evil past from which they were saved by the simple and virtuous heroes of the past generations. It amounts to a distortion of the anarchic period two centuries ago, when the imperial troops were driven out and an independent government was set up. Advanced science and atomic power in particular became identified with the old imperial regime they remember with horror."

"That so? But they have nice little ships which spotted me very handily two parsecs away. That smells of atomics to me."

Gorov shrugged, "Those ships are hold-overs of the Empire, no doubt. Probably with atomic drive. What they have, they keep. The point is that they will not innovate, and their internal economy is entirely nonatomic. That is what we must change."

"How were you going to do it?"

"By breaking the resistance at one point. To put it simply, if I could sell a penknife with a force-field blade to a nobleman, it would be to his interest to use it. Put that baldly, it sounds silly, but it is sound, psychologically. To make strategic sales at strategic points would be to create a pro-Atomics faction at court."

"A wedge to start the wedge towards economic domination. Wedges within wedges, huh? And they send you? And I'm to ransom you and leave, while you keep on trying? Isn't that sort of tail-backwards?"

"In what way?" said Dorov, guardedly.

"Listen." Devers was suddenly exasperated, "you're a diplomat, not a trader, and calling you one won't make you one. This is a case for someone who's made a business of selling—and I'm here with a full cargo stinking into uselessness, and a quota that won't ever be met, it looks like."

"You mean you're going to risk your life on something that isn't your business?" Gorov smiled thinly.

Devers said, "You mean that this is a matter of patriotism, and traders aren't patriotic?"

"Notoriously not. Pioneers never are."

"All right. I'll grant that. I don't scoot about space to save the Foundation or anything like that. But I'm out to make money, and this is my chance. If it helps the Foundation at the same time, all the better. And I've risked my life on slimmer chances."

Devers rose, and Gorov rose with him, "What are you going to do, Devers?"

The trader smiled, "Gorov, I don't know—not yet. But if the crux of the matter is to make a sale, I'm your man. I'm not a boaster as a general thing, but there's one thing I'll always back up. I've never *ended up* below quota yet."

The door to the cell opened almost instantly when he knocked, and two guards fell in on either side.

"A show!" said the Grand Master, grimly. He settled himself well into his furs, and one thin hand grasped the iron cudgel he used as a cane.

"And gold, your veneration."

"*And* gold," agreed the Grand Master, carelessly.

Devers set the box down and opened it with as fine an appearance of confidence as he could manage. He felt alone in the face of universal hostility; the way he had felt out in space his first year. The semicircle of bearded councilors who faced him down, stared unpleasantly. Among them was Pherl, the thin-faced favorite who sat next to the Grand Master in stiff hostility. Devers had met him once already and marked him immediately as prime enemy, and, as a consequence prime victim.

Outside the hall, a small army awaited events. Devers was effectively isolated from his ship; he lacked any weapon, but his attempted bribe; and Gorov was still a hostage.

He made the final adjustments on the clumsy monstrosity that had cost him a week of ingenuity, and prayed once again that the lead-lined quartz would stand the strain.

"What is it?" asked the Grand Master.

"This," said Devers, stepping back, "is a small device I have constructed myself."

"That is obvious, but not the information I want. Is it one of the black-magic abominations of your world?"

"It is atomic in nature," admitted Devers, gravely, "but none of you need touch it, or have anything to do with it. It is for myself alone, and if it contains abominations, I take the foulness of it upon myself."

The Grand Master had raised his iron cane at the machine in a threatening gesture and his lips moved rapidly and silently in a purifying invocation. The thin-faced councilor at his right leaned towards him and his straggled red mustache approached the Grand Master's ear. The ancient Askonian petulantly shrugged himself free.

"And what is the connection of

your instrument of evil and the gold that may save your countryman's life?"

"With this machine," began Devers, as his hand dropped softly onto the central chamber and caressed its hard, round flanks, "I can turn the iron you discard into gold of the finest quality. It is the only device known to man that will take iron—the ugly iron, your veneration, that props up the chair you sit in and the walls of this building—and change it to shining, heavy, yellow gold."

Devers felt himself botching it. His usual sales talk was smooth, facile and plausible; but this limped like a shot-up space wagon. But it was the content, not the form, that interested the Grand Master.

"So? Transmutation? There have been fools who have claimed the ability. They have paid for their prying sacrilege."

"Had they succeeded?"

"No." The Grand Master seemed coldly amused. "Success at producing gold would have been a crime that carried its own antidote. It is the attempt plus the failure that is fatal. Here, what can you do with my staff." He pounded the floor with it.

"Your veneration will excuse me. My device is a small model, prepared by myself, and your staff is too long."

The Grand Master's small shining eye wandered and stopped, "Randel, your buckles. Come, man, they shall be replaced doubly if need be."

The buckles passed down the line, hand to hand. The Grand Master weighed them thoughtfully. "Here," he said, and threw them to the floor.

Devers picked them up. He tugged hard before the cylinder opened, and his eyes blinked and squinted with effort as he centered the buckles carefully on the anode screen. Later, it would be easier but there must be no failures the first time.

The homemade transmuter crackled malevolently for ten minutes while the odor of ozone became faintly present. The Askonians backed away, muttering, and again Pherl whispered urgently into his ruler's ear. The Grand Master's expression was stony. He did not budge.

And the buckles were gold.

Devers held them out to the Grand Master with a murmured, "Your veneration!" but the old man hesitated, then gestured them away. His stare lingered upon the transmuter.

Devers said rapidly, "Gentlemen, this is gold. Gold through and through. You may subject it to every known physical and chemical test, if you wish to prove the point. It cannot be identified from naturally-occurring gold in any way. Any iron can be so treated. Rust will not interfere, nor will a moderate amount of alloying metals—"

But Devers spoke only to fill a vacuum. He let the buckles remain in his outstretched hand, and it was the gold that argued for him.

The Grand Master stretched out

a slow hand at last, and the thin-faced Pherl was roused to open speech. "Your veneration, the gold is from a poisoned source."

And Devers countered, "A rose can grow from the mud, your veneration. In your dealings with your neighbors, you buy material of all imaginable variety, without inquiring as to where they get it, whether from an orthodox machine blessed by your benign ancestors or from some space-spawned outrage. Come, I don't offer the machine. I offer the gold."

"Your veneration," said Pherl, "you are not responsible for the sins of foreigners who work neither with your consent nor knowledge. But to accept this strange pseudo-gold made sinfully from iron in your presence and with your consent is an affront to the living spirits of our holy ancestors."

"Yet gold is gold," said the Grand Master, doubtfully, "and is but an exchange for the heathen person of a convicted felon. Pherl, you are too critical." But he withdrew his hand.

Devers said, "You are wisdom itself, your veneration. Consider, to give up a heathen is to lose nothing for your ancestors, whereas with the gold you get in exchange, you can ornament the shrines of their holy spirits. And surely, were gold evil in itself, if such a thing could be, the evil would depart of necessity once the metal were put to such pious use."

"Now by the bones of my grandfather," said the Grand Master with surprising vehemence. His lips separated in a shrill laugh, "Pherl, what do you say of this young man?

Your face looks swell, feels better yet
When you shave with a Thin Gillette.
This blade saves time and dough what's more—
For one dime buys a pack of four!
TONITE! PHOTOGRAPH YOUR OWN PIN-UP GIRL!
Made of easy-flexing steel hard enough to cut glass
THIN Gillette BLADES
Gillette
4 for 10c
Produced By The Maker Of The Famous Gillette Blue Blade

The statement is valid. It is as valid as the words of my ancestors."

Pherl said gloomily, "So it would seem. Grant that the validity does not turn out to be a device of the Malignant Spirit."

"I'll make it even better," said Devers, suddenly. "Hold the gold in hostage. Place it on the altars of your ancestors as an offering and hold me for thirty days. If at the end of that time, there is no evidence of displeasure—if no disasters occur—surely, it would be a proof that the offering were accepted. What more can be offered?"

And when the Grand Master rose to his feet to search out disapproval, not a man in the council failed to signal his agreement. Even Pherl chewed the ragged end of his mustache and nodded curtly.

Devers smiled and meditated on the uses of a religious education.

Another week rubbed away before the meeting with Pherl was arranged. Devers felt the tension, but he was used to the feeling of physical helplessness now. He had left city limits under guard. He was in Pherl's suburban villa under guard. There was nothing to do but accept it without even looking over his shoulder.

Pherl was taller and younger outside the circle of Elders. In nonformal costume, he seemed no Elder at all.

He said abruptly, "You're a peculiar man." His close-set eyes seemed to quiver, "You've done nothing this last week, and particularly these last two hours, but imply that I need gold. It seems useless labor, for who does not? Why not advance one step?"

"It is not simply gold," said Devers, discreetly. "Not *simply* gold. Not merely a coin or two. It is rather all that lies behind gold."

"Now what can lie behind gold?" prodded Pherl, with a down-curved smile. "Certainly this is not the preliminary of another clumsy demonstration."

"Clumsy?" Devers frowned slightly.

"Oh, definitely." Pherl folded his hands and nudged them gently with his chin. "I don't criticize you. The clumsiness was on purpose, I am sure. I might have warned his veneration of *that,* had I been certain of the motive. Now had I been you, I would have produced the gold upon my ship, and offered it alone. The show you offered us and the antagonism you aroused would have been dispensed with."

"True," Dever admitted, "but since I was myself, I accepted the antagonism for the sake of attracting your attention."

"Is that it? Simply that?" Pherl made no effort to hide his contemptuous amusement. "And I imagine you suggested the thirty-day purification period that you might assure yourself time to turn the attraction into something a bit more substantial. But what if the gold turns out to be impure."

Devers allowed himself a dark humor in return, "When the judgment of that impurity depends upon those who are most interested in finding it pure?"

Pherl lifted his eyes and stared narrowly at the trader. He seemed at once surprised and satisfied.

"A sensible point. Now tell me why you wished to attract me."

"It is what I wish to do. In the short time I have been here, I have observed useful facts that concern you and interest me. For instance, you are young—very young for a member of the council, and even of a relatively young family."

"You criticize my family?"

"Not at all. Your ancestors are great and holy; all will admit that. But there are those that say you are not a member of one of the Five Tribes."

Pherl leaned back, "With all respect to those involved," and he did not hide his venom, "the Five Tribes have impoverished loins and thin blood. Not fifty members of the Tribes are alive."

"Yet there are those who say the nation would not be willing to see any man outside the Tribes as Grand Master. And so young and newly-advanced a favorite of the Grand Master is bound to make powerful enemies among the great ones of the State—it is said. His veneration is aging and his protection will not last past his death, when it is an enemy of yours who will undoubtedly be the one to interpret the words of his Spirit."

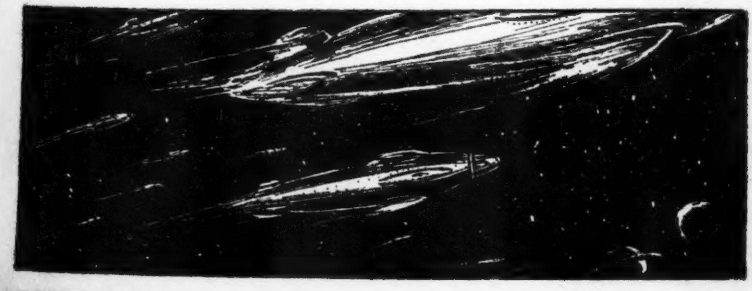
Pherl scowled, "For a foreigner you hear much. Such ears were made for cropping."

"That may be decided later."

"Let me anticipate." Pherl stirred impatiently in his seat. "You're going to offer me wealth and power in terms of those evil little machines you carry in your ship. Well?"

"Suppose it so. What would be your objection? Simply your standard of good and evil?"

Pherl shook his head. "Not at all. Look, my Outlander, your opinion of us in your heathen agnosticism, is what it is—but I am not the entire slave of our mythology I may appear. I am an educated man, sir, and, I hope, an enlightened one. The full depth of our religious customs, in the ritualistic rather than the ethical sense, is for the masses."



"Your objection, then?" pressed Devers, gently.

"Just that. The masses. *I* might be willing to deal with you, but your little machines must be used to be useful. How might riches come to me, if I had to use . . . what is it you sell? . . . well, a razor, for instance, only in the strictest, trembling secrecy. Even if my chin were more simply and more cleanly shaven, how would I become rich? And how would I avoid death by gas chamber or mob frightfulness if I were ever once caught using it."

Devers shrugged, "You are correct. I might point out that the remedy would be to educate your own people into the use of atomics for their convenience, and your substantial profit. It would be a gigantic piece of work; I don't deny it; but the returns would be more gigantic. But that is your concern, and, at the moment, not mine at all. For I offer neither razor, knife, nor mechanical garbage disposer."

"What do you offer?"

"Gold itself. Directly. You may have the machine I demonstrated last week."

And now Pherl stiffened and the skin on his forehead moved jerkily. "The transmuter?"

"Exactly. Your supply of gold will equal your supply of iron. That, I imagine, is sufficient for all needs. Sufficient for the Grand Mastership itself, despite youth and enemies. And it is safe."

"In what way?"

"In that secrecy is the essence of its use. That same secrecy you described as the only safety with regard to atomics. You may bury the transmuter in the deepest dungeon of the strongest fortress on your furthest estate, and it will still bring you instant wealth. It is the *gold* you buy, not the machine, and that gold bears no trace of its manufacture, for it cannot be told from the natural creation."

"And who is to operate the machine?"

"Yourself. Five minutes teaching is all you will require. I'll set it up for you wherever you wish."

"And in return?"

"Well," Devers grew cautious. "I ask a price, and a handsome one. It is my living. Let us say, for it is a valuable machine, the equivalent of a cubic foot of gold in iron ore."

Pherl laughed, and Devers grew red. "I point out, sir," he added, stiffly, "that you can get your price back in two hours."

"True, and in one hour, you might be gone, and my machine might suddenly turn out to be useless. I'll need a guarantee."

"You have my word."

"A very good one," Pherl bowed sardonically, "but your presence would be an even better assurance. I'll give you *my* word to pay you one week after delivery in working order."

"Impossible."

"Impossible? When you've already incurred the death penalty very handily by even offering to sell me anything. The only alternative is my word that you'll get the gas chamber tomorrow otherwise."

Devers' face was expressionless, but his eyes might have flickered. He said, "It is an unfair advantage. You will at least put your promise in writing?"

"And also become liable for execution? No, sir!" Pherl smiled a broad satisfaction. "No, sir! Only one of us is a fool."

The trader said in a small voice, "It is agreed, then."

Gorov was released on the thirtieth day, and five hundred pounds of the yellowest gold took his place. And with him was released the quarantined and untouched abomination that was his ship.

Then, as on the journey into the Askonian system, so on the journey out, the cylinder of sleek little ships ushered them on their way.

Devers watched the dimly sun-lit speck that was Gorov's ship while Gorov's voice pierced through to him, clear and thin on the tight, distortion-bounded ether-beam.

He was saying, "But it isn't what's wanted, Devers. A transmuter won't do. Where did you get one, anyway?"

"I didn't," Devers' answer was patient. "I juiced it up out of a food irradiation chamber. It isn't any good, really. The power consumption is prohibitive on any large scale or the Foundation would use transmutation instead of chasing all over the Galaxy for heavy metals. It's one of the standard tricks every trader uses, except that I never saw an iron-to-gold one before. But it's impressive, and it works—very temporarily."

"All right. But that particular trick is no good."

"It got you out of a nasty spot."

"That is very far from the point. Especially since I've got to go back, once we shake our solicitous comrades."

"Why?"

"You yourself explained it to this politician of yours." Gorov's voice was on edge, "Your entire salespoint rested on the fact that the transmuter was a means to an end, of no value in itself; that he was buying the gold, not the machine. It was good psychology, since it worked, but—"

"But?" Devers urged blandly and obtusely.

The voice from the receiver grew shriller, "But we want to sell them a machine of value in itself; something they would want to use openly; something that would tend to force them out in favor of atomic techniques as a matter of self-interest."

"I understand all that," said Devers, gently. "You once explained it. But look at what follows from my sale, will you? As long as that transmuter lasts, Pherl will coin gold; and it will last long enough to buy him the next election. The present Grand Master won't last long."

"You count on gratitude?" asked Gorov, coldly.

"No—on intelligent self-interest. The transmuter gets him an election; other mechanisms—"

"No! No! Your premise is twisted. It's not the transmuter, he'll credit—it'll be the good, old-fashioned gold. That's what I'm trying to tell you."

Devers grinned and shifted into a more comfortable position. All right. He'd baited the poor fellow sufficiently. Gorov was beginning to sound wild.

The trader said, "Not so fast, Gorov. I haven't finished. There are other gadgets already involved."

There was a short silence. Then, Gorov's voice sounded cautiously, "What other gadgets?"

Devers gestured automatically and uselessly, "You see that escort?"

"I do," said Gorov shortly. "Tell me about those gadgets."

"I am . . . if you'll listen. That's Pherl's private navy escorting us. A special honor to him from the Grand Master that he managed to squeeze out."

"So?"

"And where do you think he's taking us? To his mining estates on the outskirts of Askone, that's where. Listen!" Dever was suddenly fiery, "I told you I was in this to make money, not to save worlds. All right. I sold that transmuter for nothing. Nothing except the risk of the gas chamber and that doesn't count towards the quota."

"Get back to the mining estates, Devers. Where do they come in?"

"With the profits. We're stacking up on tin, Gorov. Tin to fill every last cubic foot this old scow can scrape up, and then some more for yours. I'm going down with Pherl to collect, old man, and you're going to cover me from upstairs with every gun you've got—just in case Pherl isn't as sporting about the matter as he lets on to be. That tin's my profit."

"For the transmuter?"

"For my entire cargo of atomics. At double price, plus a bonus." He shrugged, almost apologetically. "I admit I gouged him, but I've got to make quota, don't I?"

Gorov was evidently lost. He said, weakly, "Do you mind explaining?"

"What's there to explain? It's obvious, Gorov. Look, the clever dog thought he had me in a foolproof trap, because his word was worth more than mine to the Grand Master. He took the transmuter. That was a capital crime in Askone. But at any time he could say that he had lured me on into a trap with the purest of patriotic motives, and denounce me as a seller of forbidden things."

"*That* was obvious."

"Sure, but word against simple word wasn't all there was to it. You see, he'd never heard nor conceived of a micro film-recorder."

Gorov laughed suddenly.

"That's right," said Devers. "He had the upper hand. I was properly chastened. But when I set up the transmuter for him in my whipped-dog fashion, I incorporated the recorder into the device and removed it in the next day's overhaul. I had a perfect record of his sanctum sanctorum, his holy-of-holies, with he himself, poor Pherl, operating the transmuter for all the ergs it had, and crowing over his first piece of gold as if it were an egg he had just laid."

"You showed him the results?"

"Two days later. The poor sap had never seen three-dimensional color-sound images in his life. He claims he isn't superstitious, but if I ever saw an adult look as scared as he did then, call me rookie. When I told him I had a recorder planted in the city square, set to go off at midnight with a million fanatical Askonians to watch, and to tear him to pieces subsequently, he was gibbering at my knees in half a second. Ready to make any deal I wanted."

"Did you?" Gorov's voice was suppressing laughter. "I mean, have one planted in the city square."

"No, that sounded good, but I really had one in the palace courtyard which didn't sound as impressive but was much more dangerous really. He made the deal. He bought every gadget I've got—and yours, too—for as much tin as we could carry. The agreement is in writing, and you'll have a copy before I go down with him."

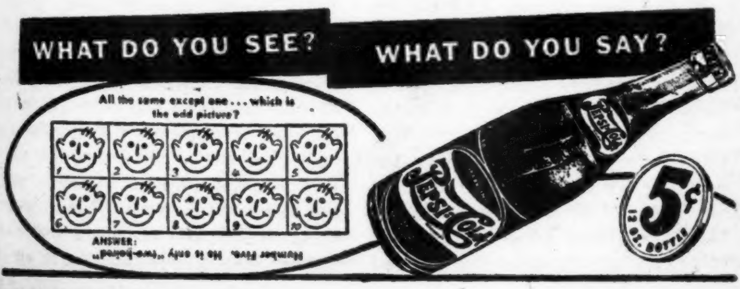
Gorov sobered up, "But you've damaged his ego. Will he use the gadgets?"

"Why not? It's his only way of recouping his losses, and if he makes money out of it, he'll salve his pride. And he *will* be the next Grand Master—and the best man we could have in our favor."

"Yes," said Gorov, explosively, "it was a good sale, but you've certainly got an uncomfortable sales-technique. No wonder you got kicked out of a seminary. You've got no sense of morals."

"What's the odds?" said Devers, indifferently. "You know what Salvor Hardin said about a sense of morals."

THE END.



WHAT DO YOU SEE?
WHAT DO YOU SAY?
All the same except one . . . which is the odd picture?
1
2
3
4
5
6
7
8
9
10
ANSWER:
Number Five. He is only "two-faced."
Pepsi-Cola
Pepsi-Cola
5¢
12 OZ. BOTTLE

Kindness

by LESTER DEL RAY

***Part** of any true higher civilization must be an innate respect for the feelings and personalities of others. To be genuinely superior, supermen must have that understanding—*

Illustrated by Orban

The wind eddied idly around the corner and past the secluded park bench. It caught fitfully at the paper on the ground, turning the pages, then picked up a section and blew away with it, leaving gaudy-colored comics uppermost. Danny moved further into the sunlight, his eyes dropping to the children's page exposed.

But it was no use; he made no effort to pick up the paper. In a world where even the children's comics needed explaining, there could be nothing of interest to the last living homo sapiens. His foot kicked the paper away, under the bench where it would no longer remind him of his deficiencies. There had been a time when he had tried to reason slowly over the omitted steps of logic and find the point to such things, sometimes successfully, more often not; but now he left it to the quick, intuitive thinking of those about him. Nothing fell flatter than a joke that had to be reasoned out slowly.

Homo sapiens! In the dim, remote days when his ancestors had owned the world, they had made jokes about it, shortening it to "homo sap," and laughing, because they'd known no other species to rival them. It was no longer a joke. Homo intelligens was now the master, and he was only a living fossil, painfully aware that the old pun had become reality. Danny was the last man in a world of supermen, cursing the selfishness of the mother who had borne him to ease her own loneliness and then died to leave that loneliness as his heritage!

He drew farther back on the bench as the steps of a young couple reached his ears, pulling his hat down to avoid recognition. But they went by, preoccupied with their own affairs, leaving only a scattered bit of conversation in his ears. He turned it over, trying senselessly to decode it.

Impossible! Even in the casual talk, there were too many steps of logic left out. Reasoning no longer sufficed, among these supermen and women who could short-circuit the cumbersome steps of logic by intuition and arrive instantly at a full picture of the whole from some minor bit added to the facts already stored in their completely organized heads. Homo sapiens had invented reason to replace the uncertain trial-and-error thinking of the other animals, and had ruled supreme for a million years. Now homo intelligens had replaced that with full intuition that leaped from fact to conclusion without going through the painful intermediate steps of reasoning, and the new supremacy was his.

Somehow, soon, those escape plans must be completed, before the last of his little courage was gone! Danny stirred restlessly, and the work tokens in his pocket set up a faint jingling sound. More charity, or occupational therapy! For six hours a day, five days a week, he worked in a little office, painfully doing routine work that could probably have been done better by machinery. Oh, they assured him that his manual skill was as great as theirs and was needed, but he could never be sure. In their unfailing kindness, they had probably decided it was better for him to live as normal a life as they could devise, and then had created the job to fit the decision.

Other footsteps came down the little path, but he did not look up until they stopped. "Hi, Danny! You weren't at the Library, and Miss Larsen said, pay day, weather, and all, I'd find you here. How's everything?"

Outwardly, Jack Thorpe's body might have been the twin of his own well-muscled one, and the smiling face above it bore no distinguishing characteristics. The mutation had been within, a quicker, more complex relation of brain cell to brain cell that had no accompanying physical changes. Danny nodded at Jack, drawing over reluctantly to make way for this man who had been his playmate when they were both too young for the difference to matter so much.

He did not ask the reasons behind the librarian's knowledge of his whereabouts; so far as he knew, there was no particular pattern to his coming here, but to the others there must be one. He forced a smile onto his own face.

"Hi, Jack. Fine! I thought you were on Mars."

Thorpe frowned, as if an effort were needed to remember that the mind beside him was different, and his words bore the careful phrasing of all those who spoke to Danny.

"I finished that, for the time being; I'm supposed to report to Venus next. They're having trouble getting an even balance of sex in their offspring there, you know. Thought you might want to come along. You've never been Outside, and you were always bugs about those old space stories, I remember."

"I still am, Jack. But—" He knew what it meant, of course. Those who looked after him behind the scenes had detected the growing discontent, and were hoping to distract him with this chance to see the places his fathers had conquered in the heyday of his race. But he had no wish to see them as they now were, filled with the busy work of the new men; it was better to imagine them as they had once been, rather than see reality. And the ship was here; there could be no chance for escape from those other worlds.

Jack nodded quickly, with the almost telepathic understanding of his race. "Of course. Suit yourself, fellow. Going up the Heights? Miss Larsen says she has something for you."

"Not yet, Jack. I thought I might look at . . . drop by the old Museum."

"Oh." Thorpe got up slowly, brushing his suit with idle fingers. "Danny!"

"Uh?"

"I probably know you better than anyone else, fellow, so—" He hesitated, shrugged, and went on. "Don't mind if I jump to conclusions; I won't talk out of turn. But best of luck—and good-by, Danny!"

He was gone, almost instantly, leaving Danny's heart stuck in his throat. A few words, a facial expression, probably some childhood memories, and he might as well have revealed his most cherished secret hopes in shouted words! How many others knew of his interest in the old ship in the Museum and his careful plot to escape this kindly, charity-filled Gehenna?

He crushed a cigarette under his heel, trying to forget the thought. Jack had played with him as a child, and the others hadn't. He'd have to base his hopes on that and be even more careful never to think of the idea around others. In the meantime, he'd stay away from the ship! Perhaps in that way the subtle warning of Thorpe's words might work in his favor—provided the man had meant his promise of silence.

Danny forced his doubts away, grimly conscious that he dared not lose hope in this last desperate scheme for independence and self-respect; the other way lay despair and listless hopelessness, the same empty death from an acute inferiority complex that had claimed the diminishing numbers of his own kind and left him as the last, lonely specimen. Somehow, he'd succeed. And in the meantime, he would go to the Library and leave the Museum severely alone.

There was a throng of people leaving the Library as Danny came up the escalator, but either they did not recognize him with his hat pulled low or sensed his desire and pretended not to. He slipped into one of the less used hallways and made his way toward the Historic Documents section, where Miss Larsen was putting away the reading tapes and preparing to leave.

But she tossed them aside quickly as he came in and smiled up at him, the rich, warm smile of her people. "Hello, Danny! Did your friend find you all right?"

"Mm-m-m. He said you had something for me."

"I have." There was pleasure in her face as she turned back toward the desk behind her, to come up with a small wrapped parcel. For the thousandth time, he caught himself wishing she were of his race and quenching the feeling as he realized what her attitude must really be. To her, the small talk from his race's past was a subject of historic interest, no more. "Guess what?"

But in spite of himself, his face lighted, both at the game and the package. "The magazines! The lost issues of *Space Trails?*" There had been only the first installment of a story extant, and yet that single part had set his pulses throbbing as few of the other ancient stories of his ancestors' conquest of space had done. Now, with the missing sections, life would be filled with zest for a few more hours as he followed the fictional exploits of a conqueror who had known no fear of keener minds.

"Not quite, Danny, but almost. We couldn't locate even a trace of them, but I gave the first installment to Bryant Kenning last week, and he finished it for you." Her voice was apologetic. "Of course the words won't be quite identical, but Kenning swears that the story is undoubtedly exactly the same in structure as it would have been, and the style is duplicated almost perfectly!"

Like that! Kenning had taken the first pages of a novel that had meant weeks and months of thought to some ancient writer and had found in them the whole plot, clearly revealed, instantly his! A night's labor had been needed to duplicate it, probably, a disagreeable and boring piece of work, but not a difficult one! Danny did not question the accuracy of the duplication, since Kenning was their greatest historical novelist. But the pleasure went out of it.

He took the package, noting that some illustrator had even copied the old artist's style, and that it was set up to match the original format. "Thank you, Miss Larsen. I'm sorry to put all of you to so much trouble. And it was nice of Mr. Kenning!"

Her face had fallen with his, but she pretended not to notice. "He wanted to do it—volunteered when he heard we were searching for the missing copies. And if there are any others with pieces missing, Danny, he wants you to let him know. You two are about the only ones who use this division now; why don't you drop by and see him? If you'd like to go tonight—"

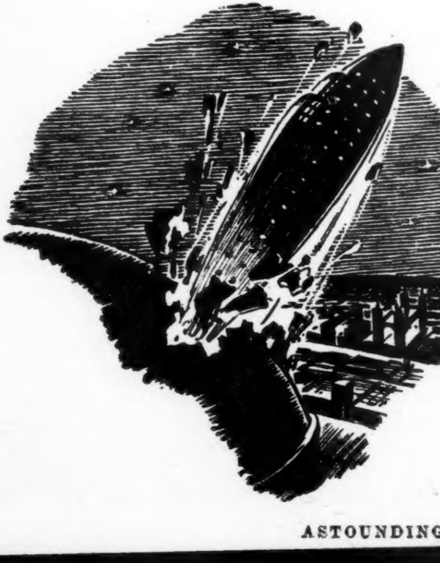
"Thanks. But I'll read this tonight, instead. Tell him I'm very grateful, though, will you?" But he paused, wondering again whether he dared ask for tapes on the history of the asteroids; no, there would be too much risk of her guessing, either now or later. He dared not trust any of them with a hint of his plan.

Miss Larsen smiled again, half winking at him. "O.K., Danny, I'll tell him. 'Night!"

Outside, with the cool of evening beginning to fall, Danny found his way into the untraveled sections and let his feet guide him. Once, as a group came toward him, he crossed the street without thinking, and went on. The package under his arm grew heavy, and he shifted it, torn between a desire to find what had happened to the hero and a disgust at his own sapient mind for not knowing. Probably, in the long run, he'd end up by going home and reading it, but for the moment he was nearest content to let his feet carry him along idly, holding most of his thoughts in abeyance.

Another small park was in his path, and he crossed it slowly, the babble of small children's voices only partly heard until he came to them, two boys and a girl. The supervisor, who should have had them back at the Center, was a dim shape in the far shadows, with another, dimmer shape beside her, leaving the three five-year-olds happily engaged in the ancient pastime of getting dirty and impressing each other.

Danny stopped, a slow smile creeping onto his lips. At that age, their intuitive faculty was just be-



ginning, and their little games and pretenses made sense that was like a tonic to him. Vaguely, he remembered his own friends of that age beginning uncertainly to acquire the trick of seeming omniscience, and his worries at being left behind. For a time, the occasional flashes of intuition that had always blessed even homo sapiens gave him hope, but eventually the supervisor had been forced to tell him that he was different, and why. Now he thrust those painful memories aside and slipped quietly forward into the game.

They accepted him with the easy nonchalance of children who have no repressions, feverishly trying to build their sand-castles higher than his; but in that, his experience was greater than theirs, and his judgment of the damp medium surer. A perverse glow of accomplishment grew inside him as he added still another story to the towering structure and built a bridge, propped up with sticks and leaves, leading to it.

Then the lights came on, illuminating the sandbox and those inside and dispelling the shadows of dusk. The little boy glanced up, really seeing him for the first time. "Oh, you're Danny Black, ain't you? I seen your pi'ture. Judy, Maysie, look! It's that man—"

But their voices faded out as he ran off through the park and into the deserted byways again, clutching the package to him. Fool! To delight in beating children at a useless game, or to be surprised that they should know him! He slowed to a walk, twitching his lips at the thought that by now the supervisor would be reprimanding them for their thoughtlessness. And still his feet went on, unguided.

It was inevitable, of course, that they should lead him to the Museum, where all his secret hopes centered, but he was surprised to look up and see it before him. And then he was glad. Surely they could read nothing into this visit, unpremeditated, just before the place closed. He caught his breath, forced his face into lines of mere casual interest, and went inside, down the long corridors, and to the hall of the ship.

She rested there, pointed slightly skyward, sleek and immense even in a room designed to appear like the distant reaches of space. For six hundred feet, gleaming metal formed a smooth frictionless surface that slid gracefully from the blunt bow back toward the narrow stern with its blackened ion jets.

This, Danny knew, was the last and greatest of the space liners his people had built at the height of their glory. And even before her, the mutation had been caused by the radiation of deep space, the results were spreading. For a time, as the log books indicated, she had sailed out to Mars, to Venus, and to the other points of man's empire, while the tension slowly mounted at home. There had never been another wholly sapient-designed ship, for the new race was making its greater power felt, with the invert-matter rocket replacing the older, less efficient, ion rocket the ship still carried. Eventually, unable to compete with the new models, she had been retired from service and junked, while the War passed by her and buried her under tons of rubble, leaving no memory of her existence.

And now, carefully excavated from the old ruins of the drydock where she had lain so long, she had been enthroned in state for the last year, here in the Museum of Sapient History, while all Danny's hopes and prayers had centered around her. There was still a feeling of awe in him as he started slowly across the carpeted floor toward the open lock and the lighted interior.

"Danny!" The sudden word interrupted him, bringing him about with a guilty start, but it was only Professor Kirk, and he relaxed again. The old archæologist came toward him, his smile barely visible in the half-light of the immense dome. "I'd about given you up, boy, and started out. But I happened to look back and see you. Thought you might be interested in some information I just came onto today."

"Information about the ship?"

"What else? Here, come on inside her and into the lounge—I have a few privileges here, and we might as well be comfortable. You know, as I grow older, I find myself appreciating your ancestors' ideas of comfort, Danny. Sort of a pity our own culture is too new for much luxuriousness yet." Of all the new race, he seemed the most completely at ease before Danny, partly because of his age, and partly because they had shared the same enthusiasm for the great ship when it had first arrived.

Now he settled back into one of the old divans, using his immunity to ordinary rules to light a cigarette and pass one to the younger man. "You know all the supplies and things in the ship have puzzled us both, and we couldn't find any record of them? The log ends when they put the old ship up for junking, you remember, and we couldn't figure out why it had been restored and restocked, all ready for some long voyage to somewhere. Well, it came to light in some further excavations they've completed. Danny, your people did that, during the War; or really, after they'd lost the War!"

Danny straightened. The War was a period of history he'd avoided, mostly, though he knew the outlines of it. With homo intelligens increasing and pressing the older race aside by the laws of survival value, his people had made a final desperate bid for supremacy. And while the new race had not wanted the War, they had been forced finally to fight back with as little mercy as had been shown them; and since they had the tremendous advantage of the new intuitive thinking, there had been only thousands left of the original millions of the old race when its brief course was finished. It had been inevitable, probably, from the first mutation, but it was not something Danny cared to dwell on. Now he nodded, and let the other continue.

"Your ancestors were beaten, then, Danny, but they weren't completely crushed, and they put about the last bit of energy they had into rebuilding this ship—the only navigable one left them—and restocking it. They were going to go out somewhere, they didn't know quite where, even to another solar system, and take some of the old race for a new start, away from us. It was their last bid for survival, and it failed when my people learned of it and blasted the docks down over the ship, but it was a glorious failure, boy! I thought you'd want to know."

Danny's thoughts centered slowly. "You mean everything on the ship is from my people? But surely the provisions wouldn't have remained usable after all this time!"

"They did, though; the tests we made proved that conclusively. Your people knew how to preserve things as well as we do, and they expected to be drifting in her for half a century, maybe. They'll be usable a thousand years from now." He chucked his cigarette across the room and chuckled in pleased surprise when it fell accurately into a snuffer. "I stuck around, really, to tell you, and I've kept the papers over at the school for you to see. Why not come over with me now?"

"Not now, sir. I'd rather stay here a little longer."

Professor Kirk nodded, pulling himself up reluctantly. "As you wish. . . . I know how you feel, and I'm sorry about their moving the ship myself. We'll miss her, Danny."

"Moving the ship?"

"Hadn't you heard? I thought that's why you came around at this hour. They want her over in London, and they're bringing one of the old Lunar ships here to replace her. Too bad!" He touched the walls thoughtfully, drawing his hands down and across the rich nap on the seat. "Well, don't stay too long, and turn her lights out before you leave. Place'll be closed in half an hour. 'Night, Danny!"

" 'Night, professor." Danny sat frozen on the soft seat, listening to the slow tread of the old man and the beating of his own heart. They were moving the ship, ripping his plans to shreds, leaving him stranded in the world of a new race, where even the children were sorry for him.

It had meant so much, even to feel that somehow he would escape, some day! Impatiently, he snapped off the lights, feeling closer to the ship in the privacy of the dark, where no watchman could see his emotion. For a year now he had built his life around the idea of taking this ship out and away, to leave the new race far behind. Long, carefully casual months of work had been spent in learning her structure, finding all her stores, assuring himself bit by bit from a hundred old books that he could operate her.

She had seemed designed for the job, built to be operated by one man, even a cripple, in an emergency, and nearly everything was automatic. Only the problem of a destination had remained, since the planets were all swarming with the others, but the ship's logs had suggested the answer even to that.

Once there had been rich men among his people who sought novelty and seclusion, and found them among the larger asteroids; money and science had built them artificial gravities and given them atmospheres, powered by atomic-energy plants that should last forever. Now the rich men were undoubtedly dead, and the new race had abandoned such useless things. Surely, somewhere among them, there should have been a haven for him, made safe by the very numbers that could baffle almost any search.

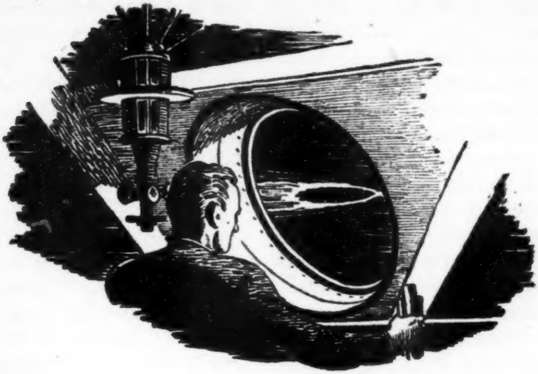
Danny heard a guard go by, and slowly got to his feet, to go out again into a world that would no longer hold even that hope. It had been a lovely plan to dream on, a necessary dream. Then the sound of the great doors came to his ears, closing! The professor had forgotten to tell them of his presence! And—!

All right, so he didn't know the history of all those little worlds; perhaps he would have to hunt through them, one by one, to find a suitable home. Did it matter? In every other way, he could never be more ready. For a moment only, he hesitated; then his hands fumbled with the great lock's control switch, and it swung to quietly in the dark, shutting the sound of his running feet back from outside ears.

The little lights came on silently as he found the navigation chair and sank into it. "Ship Sealed... Air O. K. . . . Power, Automatic . . . Engine, Automatic . . ." Half a hundred little lights and dials that told the story of a ship ready for a touch of his hand. He moved the course plotter slowly along the tiny atmospheric map until it reached the top of the stratosphere; the big star map moved slowly out, with the pointer in his fingers tracing an irregular, jagged line that would lead him somewhere toward the asteroids, well away from the present position of Mars, and yet could offer no clue. Later he could set the analyzers to finding the present orbit and location of some chosen asteroid and determine his course more accurately, but all that mattered now was to get away, beyond all tracing, before his loss could be reported.

Seconds later his fingers pressed down savagely on the main power switch, and there was a lurch of starting, followed by another slight one as the walls of the Museum crumpled before the savage force of the great ion rockets. On the map, a tiny spot of light appeared, marking the ship's changing position. The world was behind him now, and there was no one to look at his efforts in kindly pity or remind him of his weakness. Only blind fate was against him, and his ancestors had met and conquered that long before.

A bell rang, indicating the end of the atmosphere, and the big automatic pilot began clucking contentedly, emitting a louder cluck now and then as it found the ir-



regularities in the unorthodox course he had charted and swung the ship to follow. Danny watched it, satisfied that it was working. His ancestors may have been capable of reason only, but they had built machines that were almost intuitive and had managed, as the ship about him testified. His head was higher as he turned back to the kitchen, and there was a bit of a swagger to his walk.

The food was still good. He wolfed it down, remembering that supper had been forgotten, and studying slowly through the big log books of the long voyages made by the ship, searching through it for each casual reference to the asteroids. Ceres, Palas, Vesta, some of the ones referred to by nicknames or numbers?

But he had decided when he stood once again in the navigation room, watching the aloof immensity of space: out here it was relieved only by the tiny hot pinpoints that must be stars, colored, small, and intense as no stars could be through an atmosphere. It would be one of the numbered planetoids, referred to also as "The Dane's" in the log. The word was meaningless, but it seemed to have been one of the newer and more completely terrenized, though not the very newest, where any search would surely start.

He set the automatic analyzer to running from the key numbers in the manual and watched it for a time, but it ground on slowly, tracing through all the years that had passed. For a time, he fiddled with the radio, before he remembered that it operated on a wave form no longer used. It was just as well; his severance from the new race would be all the more final.

Still the analyzer ground on. Space lost its novelty, and the operation of the pilot ceased to interest him. He wandered back through the ship toward the lounge, to spy the parcel where he had dropped and forgotten it. There was nothing else to do.

And once begun, he forgot his doubts at the fact that it was Kenning's story, not the original; there was the same sweep to the tale, the same warm and human characters, the same drive of a race that had felt the mastership of destiny so long ago. Small wonder the readers of that time had named it the greatest epic of space to be written!

Once he stopped, as the analyzer reached its conclusions and bonged softly, to set the controls on the automatic for the little world that might be his home, with luck. And then the ship moved on, no longer veering, but making the slightly curved path its selectors found most suitable, while Danny read further, huddled over the story in the navigator's chair, feeling a new and greater kinship with the characters of the story. He was no longer a poor Earth-bound charity case, but a man and an adventurer with them!

His nerves were tingling with that glow when the tale came to its end, and he let it drop onto the floor from tired fingers. Under his hand, a light had sprung up, but he was oblivious to it, until a crashing gong sounded over him, jerking him from the chair. There had been such a gong described in the story—

And the meaning was the same. His eyes made out the red letters that glared accusingly from the control panel: RADIATION AT TEN O'CLOCK HORIZ. SHIP INDICATED!

Danny's fingers were on the master switch and cutting off all life except pseudogravity from the ship as the thought penetrated. The other ship was not hard to find from the observation window; the great streak of an invert-matter rocket glowed hotly out there, pointed apparently back to Earth—probably the *Callistan!*

For a second he was sure they had spotted him, but the flicker must have been only a minor correction to adjust for some small error for the trail continued. He had no knowledge of the new ships and whether they carried warning signals or not, but apparently they must have dispensed with such things. The streak vanished into the distance, and the letters on the panel that had marked its changing position went dead. Danny waited until the fullest amplification showed no response before throwing power on again. The small glow of the ion rocket would be invisible at the distance, surely.

Nothing further seemed to occur; there was a contented purr from the pilot and the faint sleepy hum of raw power from the rear, but no bells or sudden sounds. Slowly, his head fell forward over the navigator's table, and his heavy breathing mixed with the low sounds of the room. The ship went on about its business as it had been designed to do. Its course was charted, even to the old landing sweep, and it needed no further attention.

That was proved when the slow ringing of a bell woke Danny, while the board blinked in time to it:

Destination! Destination! Destination!

He shut off everything, rubbing the sleep from his eyes, and looked out. Above, there was weak but warm sunlight streaming down from a bluish sky that held a few small clouds suspended close to the ground. Beyond the ship, where it lay on a neglected sandy landing field, was the green of grass and the wild profusion of a forest. The horizon dropped off sharply, reminding him that it was only a tiny world, but otherwise it might have been Earth. He spotted an unkempt hangar ahead and applied weak power to the underjets, testing until they moved the ship slowly forward and inside, out of the view of any above.

Then he was at the lock, fumbling with the switch. As it opened, he could smell the clean fragrance of growing things, and there was the sound of birds nearby. A rabbit hopped leisurely out from underfoot as he stumbled eagerly out to the sunlight, and weeds and underbrush were already spreading to cover the buildings about him. For a moment, he sighed; it had been too easy, this discovery of heaven on the first wild try.

But the sight of the buildings drove back the doubt. Once, surrounded by a pretentious formal garden, there had been a great stone mansion, now falling into ruins. Beside it and further from him, a smaller house had been built, seemingly from the wreckage. That was still whole, though ivy had grown over it and half covered the door that came open at the touch of his fingers.

There was still a faint glow to the heaters that drew power from the great atomic plant that gave this little world a perpetual semblance of Earthliness, but a coating of dust was everywhere. The furnishings, though, were in good condition. He scanned over them, recognizing some as similar to the pieces in the Museum, and the products of his race. One by one he studied this—his fortune, now, and his home!

On the table, a book was dropped casually, and there was a sheet of paper propped against it, with something that might have been a girl's rough handwriting on it. Curiosity carried him closer, until he could make it out, through the dust that clung even after he shook it.

Dad:

Charley Summers found a wrecked ship of those things, and came for me. We'll be living high on 13. Come on over, if your jets will make it, and meet your son-in-law.

There was no date, nothing to indicate whether "Dad" had returned, or what had happened to them. But Danny dropped it reverently back on the table, looking out across the landing strip as if to see a worn old ship crawl in through the brief twilight that was falling over the tiny world. "Those things" could only be the new race, after the War; and that meant that here was the final outpost of his people. The note might be ten years or half a dozen centuries old—but his people had been here, fighting on and managing to live, after Earth had been lost to them. If they could, so could he!

And unlikely though it seemed, there might possibly be more of them out there somewhere. Perhaps the race was still surviving in spite of time and trouble and even homo intelligens.

His eyes were moist as he stepped back from the door and the darkness outside to begin cleaning his new home. If any were there, he'd find them. And if not—well, he was still a member of a great and daring race that could never know defeat so long as a single man might live. He would never forget that.

Back on Earth, Bryant Kenning nodded slowly to the small group as he put the communicator back, and his eyes were a bit sad in spite of the smile that lighted his face. "The Director's scout is back, and he did chose 'The Dane's'. Poor kid, I'd begun to think we waited too long, and that he never would make it. Another six months—and he'd have died like a flower out of the sun! Yet I was sure it would work when Miss Larsen showed me that story, with its mythical planetoid-paradises. A rather clever story, if you like pseudohistory; I hope the one I prepared was its equal."

"For historical inaccuracy, fully its equal." But the amusement in old Professor Kirk's voice did not reach his lips. "Well, he swallowed our lies and ran off with the ship we built him. I hope he's happy, for a while at least."

Miss Larsen folded her things together and prepared to leave. "Poor kid! He was sweet, in a pathetic sort of way. I wish that girl had turned out better; maybe this wouldn't have been necessary then. See me home, Jack?"

The two older men watched Larsen and Thorpe leave, and silence and tobacco smoke filled the room. Finally Kenning shrugged, and turned to face the professor.

"By now he's found the note. I wonder if it was a good idea, after all? When I first came across it in that story, I was thinking of Jack's preliminary report on Number Sixty-seven, but now I don't know; she's an unknown quantity, at best. Anyhow, I meant it for kindness."

"Kindness. Kindness to repay with a few million credits and a few thousands of hours of work—plus a lie here and there—for all that we owe the boy's race!" The professor's voice was tired, as he dumped the contents of his pipe into a snuffer, and strode over slowly toward the great window that looked out on the night sky. "I wonder, sometimes, Bryant, what kindness Neanderthaler found when the last one came to die. Or whether the race that will follow us when the darkness falls on us will have something better than such kindness."

The novelist shook his head slowly, and there was silence again as they looked out across the world and toward the stars.

THE END.

Brass Tacks

It's highly interesting that science-fiction, the imaginative, has barely been able to keep somewhere near the scientific weapons this war has developed. But—while the imagination couldn't get ahead much, the science has proved out extremely well.

Dear Mr. Campbell:

After almost ten years of Astounding, I feel that the time has come to write. Chiefly in thanks. In fact, I think Astounding can be blamed for the fact that I'm now a pre-med in ASTP instead of a mud-soaked infantryman.

Another purpose, however, is to second the motion for reprints of much of the old stories from Astounding. The paper shortage no doubt makes this impracticable at the moment, but please hold the idea over for future use. And don't forget to include, if such a series should be started, to include some of the stuff from *Unknown.*

Furthermore, I wish to add my vote for printing of stories which would have formerly wound up in *Unknown.* And, Please! As much on new scientific developments as possible. More on the betatron and such. I haven't yet seen the article on the magnetic unit charge in motion, as I have just bought the April issue, but I'm looking forward to it with considerable anticipation.

Ratings: "The Changeling": Good, but a little too obscure. Doesn't follow up enough—too general. But fascinating reading.

"The Long Way": No criticism. I just read the Venus Equilateral stories in a quiet ecstasy and say nothing.

"The Bureaucrat": No luck. I still can't find anything to kick about.

"Invariant": Slightly spoiled by the use of similar idea, though differently, in "Changeling."

"Lobby": Good writing, but Simak it a little more optimistic than I.

"Sanity": Not too probable, I hope, but tops for entertainment.

Articles: Both up to standard; they're always good.

Top Story: Tie between "The Long Way," and "The Changeling."

Now for a little loose rambling: Have you ever investigated the make-up of your circulation? What varieties of people read Astounding S. F.? I know it's an entirely different group from those reading the other science-fiction books—remember long long ago when there were only three? From what I have seen the IQ of the average ASF reader is in the neighborhood of 120-130, and his training is more or less technical. And I wonder what influence ASF has had on those who have been reading it for a considerable length of time? I know it has been responsible for a large part of my education—that part which depends upon outside reading. Not only have I learned a considerable amount from the fiction and non-fiction in ASF, but also a considerably larger amount through investigations of fields of study which would otherwise have remained completely unknown to me. And most important of all I have become accustomed to accepting for purposes of discussion entirely unfamiliar premises without psychological rebellion because of the fact of newness.—Willford MacFadden.

It'd be bad though, if the one was broke his arm—

Dear Mr. Campbell:

Analytical Laboratory for April, 1944:

1. "The Long Way"—Smith
2. "The Bureaucrat"—Jameson
3. "The Changeling"—Van Vogt
4. "Sanity"—Leiber, Jr.
5. "Lobby"—Simak
6. "Invariant"—Pierce

I'm rather disappointed in this issue, Mr. Campbell. It's very, very low for Astounding. I guess we can only blame it on the war, like we blame everything else.

The first two stories were good, but the rest fell flat. Smith was swell, and Jameson good, although the story seemed to be a rehash of one of the earlier "Bullard" stories.

"The Changeling" and the shorts presented a great contrast. I was greatly disappointed in the former. It was way too long. Another thing, tell Van Vogt to let the "superman" theme rest for a while. The shorts seemed rather insipid to me. The ideas were O. K., but the authors didn't carry them out very well.

I'm awaiting that article on magnetic particles with great anticipation. If it's half as good as was promised in your editorial, it will be the classic of all the science articles Astounding has printed, and there's quite a bit of competition there.

I agree with P. S. Miller on the matter of rocket or spaceship crews. One man should be sufficient for the job. That would apply only to interplanetary jaunts—interstellar trips would be an entirely different matter.

One man should be able to handle the first lunar rocket quite efficiently. Offhand, all the functions I can think of would be cinches, so to speak. Let's see, the meteor detectors could be hooked up to make and correct changes in the course automatically. The instrument panel would be rather small, in fact, rather simple compared to the instrument panel of a modern pursuit ship. The necessary instruments would include: air pressure gauge, meteor detector, oxygen content, amount of fuel, fuel pressure, crew compartment temperature, rocket temperature, adaptation of radio altimeter for finding distance from objective—the Moon in this case—and an adaptation of the radio compass to provide a speedometer. Fuel regulation for the rocket would be fairly simple and, well, that seems to take care of most of the necessities that will occur during the actual flight. One man should be able to handle the observations to be taken of the Moon at the closest approach. (I doubt if a landing will be made on the Moon on the first attempt.)

I can see no reason why there should be more than one man on the rocket, but I can see several reasons why there shoudn't be more than that. The first, and perhaps the most important, is the matter of boredom. In spite of its thrilling aspect, a large part of the trip would be sheer monotony. The trip would be pretty short, but in that time, it would be very easy to come to hate your companion's guts so thoroughly that you'd as soon cut his throat as look at him. At least that's what would happen to me. Now, for one man, all you would have to do for one man would be to give him a stack of stf and fantasy mags to read.

Remember that article Astounding ran sometime ago about "concentrated" supplies for spaceships? There's another factor to take into consideration. If I wasn't so all-fired lazy, I'd figure just what would be needed.

Now for the first interstellar trip:

The first consideration in determining the size of the crew would be the type of propulsive equipment used. It's a sure bet it wouldn't be of the rocket type, and wouldn't have the simplicity of said type. Chances are it will be some development of atomic power or the so-called "space warp". Whatever the motive power, it must enable the ship to attain velocities exceeding, or nearly so, the velocity of light. If this wasn't done, time would weigh exceedingly heavy on the crew's hands. Remember "Proxima Centauri"? The crew had the same trouble in that. I can remember something about them spending their time "exercising such vices as they could conceive".

But, taking a lot for granted, we'll say that an efficient drive has been provided and, although complicated, is largely automatic in its operation. As an estimate, I'll say that six should suffice for the crew. (No sociologists, please!) This estimate applies only to exploratory trips—no colonization. Should both sexes be represented? Though there are many things to be taken into consideration, I'd say no. On a trip of any length, the companionship might be considered necessary by some, but that would tend to turn the trip into a honeymoon instead of a scientific affair. There's the matter of perpetuation of the human race, but, being a young feller, I don't see where it's so important. The human race, as a whole, I don't care about, but the certain member of the human race known as Stanley Skirvin is an entirely different matter.

To sum things up: the crew should remain as small as possible, both to conserve supplies and space, and to avoid personal friction. They should be highly trained in a variety of fields—no specialists—so that the loss of one member wouldn't be fatal to the success of the whole expedition. They should be of the male sex, if possible. As much of the machinery as possible should be automatic in operation. (About that matter of training: I remember reading also in Astounding that it will be easier to train mathematicians to be pilots than to train pilots to be mathematicians.")

I have a few visions and requests for Astounding and *Unknown* in the post-war scheme of things. For heaven's sake, don't go back to those clumsy things you had during 1942. They have dignity—plenty of dignity—but fooey on that stuff. Astounding got by with the standard size for twelve years, and those twelve years of mags look mighty fine in a row on a shelf—or would, if I had all of them.) Don't concentrate on that dignity, let down your hair.

To sum it up, stick to the regular size, have cover paintings on both mags, get good illustrators, and bring Don Stuart back.—Stanley Skirvin, Star Route, Licking Pike, Newport, Kentucky.

Friend, one of the prime characteristics of psychotics is that they have and hold—and I do mean cling to—one line of thought!

Dear Mr. Campbell:

First I wish to congratulate Timmins on his excellent cover painting. It is really one of the best I have seen. Although it represents no actual scene from "The Changeling", it sums up the idea of the story. I didn't know that Timmins was so good with faces, in fact, I was quite sure that he was dodging the issue by hiding the faces in his covers.

Next the Analytical Lab:

1. "The Changeling"—Van Vogt has hit the spot again, the spot being the bull's-eye. Van Vogt has the happy faculty of being able to introduce in a story a revolutionary theory as a theme and then introducing gadgets and ideas equally wonderful. This is not his best—nothing can equal "Slan!"—but it

is well above the average run of stories and will be remembered for a long time. I thought it was to be a serial because "In Times To Come" mentioned that it would be *started* in the April issue.

2. "The Bureaucrat"—Jameson's novelette won over "The Long Way" for two reasons. (A) I have waited for a Bullard story for a long time. (B) In addition to a good "technical" idea there is another view of the much maligned bureaucrat. I feel that Mr. Jameson is grooming Benton to take over a series of his own and more power to him. Jameson can write a darn good story, y' know.

3. "The Long Way"—George O. Smith's story is welcome, excellent, and satisfying. It seems to me that is deserves a first, but the other two just must be rated over it. Definitely continue the series. Orchids to Smith for his ability to continue excellent stories without having them seem jaded, or becoming infected with sequelitis—literary halitosis—which had laid so many top-rank authors down for the count.

4. "Sanity"—I like this short a lot. Lieber has advanced a very, very nice theory, but I think I can see a flaw; wouldn't the maniacs be unable to hold a train of thought long enough to be efficient? Mania—the excited phase of manic-depressive insanity—is characterized by disordered speech and thinking. Morganstern—the minister of finance—couldn't, therefore, run affairs well. Likewise with all the others. Still, a good story.

"Without It, He'd Be Dead Right Now!"

"One thing saved him. Plasma. So if he gets well, he has *you* to thank. . . . Housewife Jones, Stevedore Smith, Sophomore Brown!"

And if he didn't get the plasma . . . if he didn't get well . . . would he have *you* to blame? You, who mean to go to the Red Cross blood bank, but never quite get around to it?

Don't give it a chance to happen. Go to your blood bank NOW . . . and win a soldier's undying gratitude—as well as—perhaps—his life!

The Red Cross Needs Your Blood ....NOW!

5. "Invariant"—Pierce has written a very interesting short-short. I like the idea advanced about reaction to stimuli. This microscopic short could have been made into an A+ novelette; its brevity keeps it from the number four spot. More from this author.

6. "Lobby"—The story is O. K., but just barely. I can't quite see a man give up quite so easily in his argument for the punishment of the murderers of one hundred of his friends. It would have been a better story if Simak could have made his characters more human. 'Nuff said.

The editorial was up to its usual excellence. Dr. Ehrenhaft, who is an Austrian refugee, has advanced a truly remarkable theory. I look forward eagerly to the promised article on its next issue.

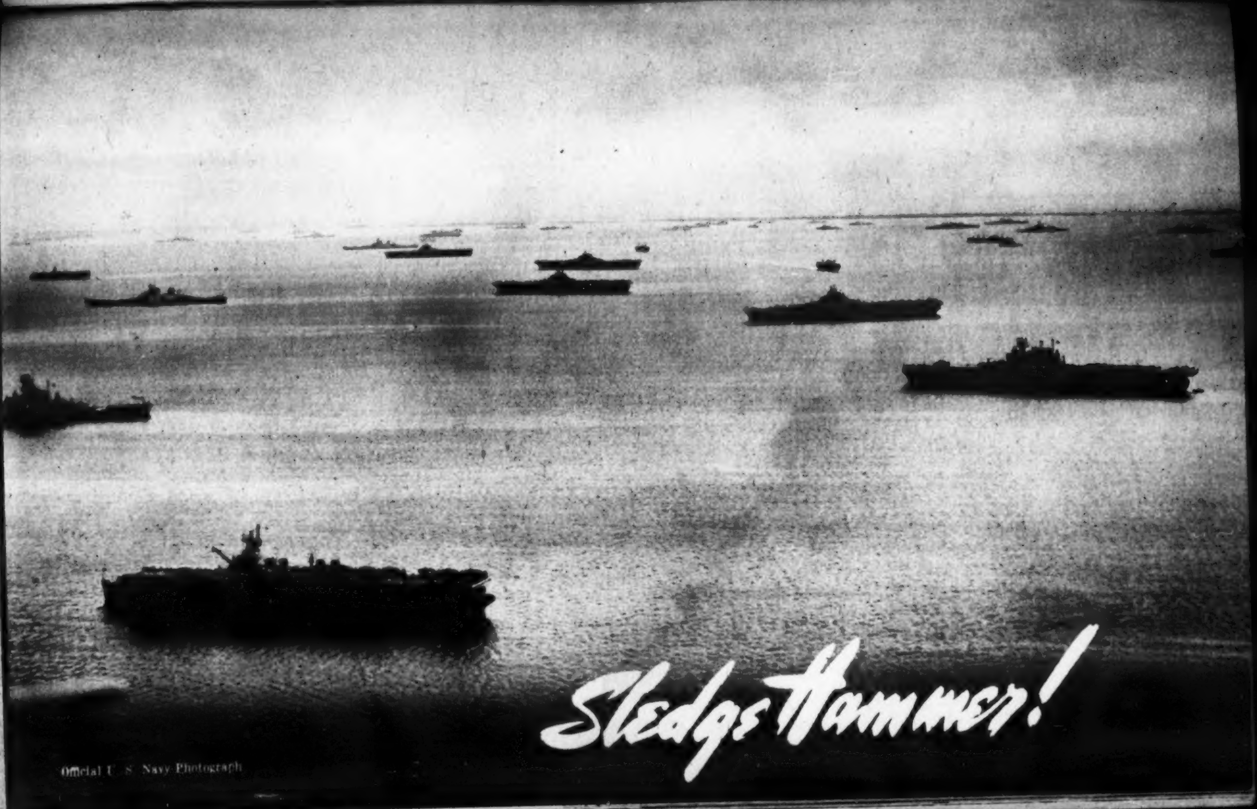
The articles are hokay. Ley and phmmph, the Great have written two edifying and interesting articles. Who is phmmph? Is he ye ed? If so why no name; it's not that bad y'know. That asymmetric plane pictured on page 99 looks just like a similar Blohm and Voss plane which is driven by a regular tractor air screw. The regular plane—which isn't so regular—is the Bv. 141. It has the crew in the nacelle and the engine in the fuselage. Is this plane just a cover-up for the jet-propelled model, like the false propeller put on the Allied jay-pee plane to disguise it? Could you please answer this? I believe that it would also be of interest to the other readers. (Don't know; could be they tried out conventional power; unconventional plane before making both unconventional. Ed.)

This issue on the whole is worthy of a 3.8 rating according to the Navy 4.0=perfect rating system. ASF is never below 3.5 I do not rate the stories according to a point system as this is sort of impossible. Whenever I have tried it I arrived at queer paradoxes with certain stories having impossible ratings. Anyway in ASF they always bunched up near the top. I can rate issues because they leave a general effect. This I can measure and do in rating issues.

This issue we have the horrible one-staple binding. My copy has already split along two of the sections of eight leaves. The backing is split and each section sort of "revolves" about the central staple; on further thought it merely oscillates. I am not indignant; I am merely reporting on a fact; I am quite sure ye Ed is doing his best. 'Nuff said.

About the future: Well, I was right. "Circle of Confusion" was the initial story of a series. O. K., I liked the "Circle"; I'll probably like "Haywire Lady." E. Mayne Hull has a serial coming up; good.

What does the cut that is the heading to Brass Tacks signify? I've always wondered. A hand describing an orbit. Hm-m-m. Could the artist be a nut? Could ye Ed be a nut? What is the answer? All right I'll go quietly.—M. Eneman, 414 West 44th Street, New York 18, New York.


Sledge Hammer!

Official U. S. Navy Photograph

THE AMERICAN WAY OF *GOING ON* LIVING

There's been considerable discussion of the "American Way of Life"; herewith we present a few pictures of the American way of going on enjoying the American way of life.

The American way of life itself involves a good bit of machine help; it's natural that, in war, the United States believes in a lot of machine fighters. The Nazis thought they had a lot of machine fighters; the Japs, of course, never believed in machines particularly anyway.

On page 99, an official Navy photograph shows Admiral Nimitz's Atoll-Crusher. Or, more precisely, a part of that well-oiled machine. It's engaged just at this writing in grinding down the somewhat more stubborn chunk of oceanic rock known as Saipan, and is at this moment showing signs of restless interest in the Bonin Islands. It is probably the first Naval force in history which has (1), announced to the world in general, and the enemy in particular, precisely what it intends to do, and where it intends to go; (2), gone out of its way—approximately

Official U. S. Navy Photograph

Official Photo U. S. Marine Corps

eight thousand miles out of its way—to provoke, enrage, and induce the enemy to engage in battle under the most favorable geographical terms possible to that enemy. It exposes itself to attack by the enemy Grand Fleet recklessly, and, moreover, piecemeal. Detached segments of the Pacific Fleet are thrown into positions where attack by the massed Imperial Japanese Fleet is openly invited.

"Tssank you sssso musch, but we aren't having any, pliss." The slight catch, well recognized by the Jap Naval commanders, lies in the fact that those scattered, separated segments of the U. S. Navy are each such terrible striking forces that the massed Jap fleet dare not approach within half a thousand miles. The U. S. fleet, in consequence, displays all the tactical subtlety of a sledge hammer attacking a child's toy fort. The masterly tactical handling of American admirals is displayed in ingenious trickery that succeeds in luring the Japs within striking range. Admiral Spruance's deadly maneuvering off Saipan-Rota-Guam, for instance, that finally inveigled the Japs into the disastrous mistake of launching an all-out

Official U. S. Navy Photograph

Naval Air attack against the fly swatter of Spruance's terrific air defense. It resulted in the practically total annihilation of Jap naval air power in that area, and came very close to catching the decidedly fleet Jap fleet with its planes down for good.

The photographs on pages 100 and 101 show bits of that atoll crusher, with some of its smaller parts going into action. On the beaches, headed into the jungles, are samples of one of the great strategic weapons of this war—a strategic weapon as potent as the air transport and freight plane. The fighter plane and the tank are tactical weapons; the air transport and the bulldozer are the strategic equivalents—and while the transport plane has been much discussed and glamourized, the bulldozer is less appreciated as the powerful strategic force it is.

Suppose the Japs land on Atoll Ababa, and the Americans, simultaneously, land on Atoll Babababa, two hundred fifty miles away. Both start carving out airfields, but quick. The Japs have brought in three thousand coolies, all that can be packed onto little Ababa efficiently. The Americans have only one hun-

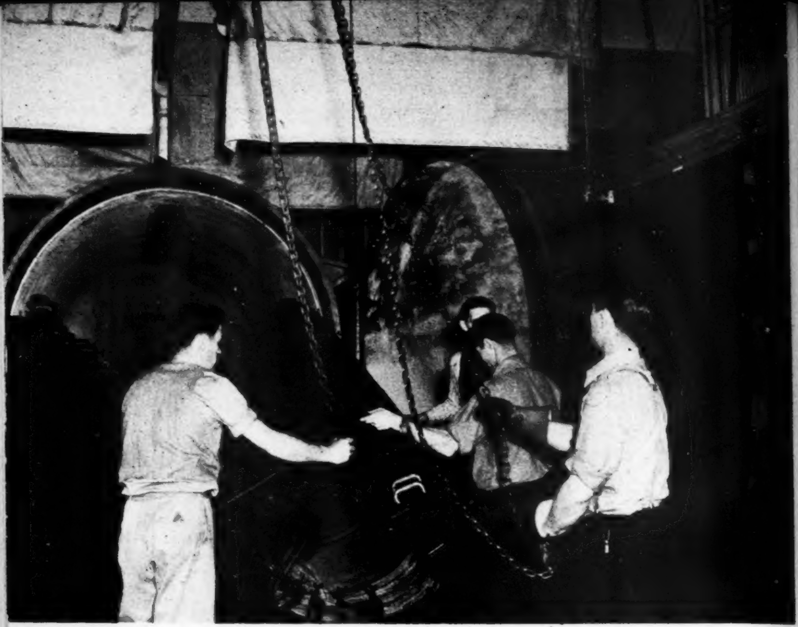
Official Photo U. S. Air Forces

dred men—but ten bulldozers, and assorted power earth-movers. Three days later, the Japs have felled the trees, and long strings of coolies are carrying dirt around. At that time the first medium bombers take off from Babababa, and, shortly thereafter, the Japs conclude there's no point in moving any more dirt; they're never going to have an airfield anyway.

Of course the Japs are the prime example of somebody who should never have even considered getting into a mechanized, technical war. The Nazis, on the other hand had a pretty good chance—so long as they fought only strictly European nations, and they could successfully take on England. Russia, be it noted, is not a European nation; Europe isn't that big. And, of course, to make the error worse, the Axis forced the United States to defend itself. The Nazis had an enormous air force—they thought.

They were unable to see the mountains beyond because of the local hills. This time the mountains of American air power have come to a would-be Mahomet.

THE END.



Fairchild Aircraft

The Fairchild Duramold process is a machine process as far as possible—and that includes everything but guns, engines, engine mounts, and landing gear!

Wooden Ships of

The final result is, in both cases, a two-engine military monoplane, consisting entirely of plastic-bonded plywood, except for the engines, the landing gear, the instruments and, of course, the guns. The two planes even look fairly much alike and from the engineering point of view it is a minor difference that one of them, the Fairchild AT 21, has been designed as an advanced trainer while the other, the much-mentioned de Havilland Mosquito, is a small fast bomber.

But while the final result is fairly

Fairchild Aircraft

On the previous page, a fuselage section, in its mold, goes into the oven; here a finished, heat-and-pressure welded section is lifted from the mold.

the Air

by WILLY LEY

The British built a wood-and-plastic plane. The Americans built a wood-and-plastic plane. The reasons why the British built theirs, the methods used, and the finished product were, however, totally different!

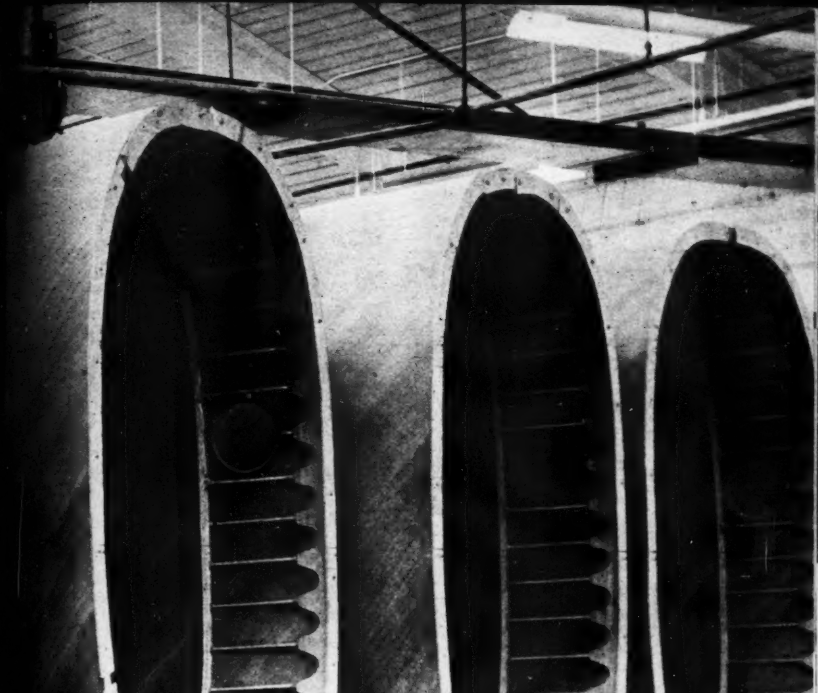
much the same, as far as general appearance and the engineering classification as plastic-bonded plywood planes go, the story of the two planes, their prenatal history as it were, are about as dissimilar as they can be and still produce a similar result. The two planes are made of different types of wood, the wood is bonded by different types of plastics and the methods of manufacture present the two extremes: skilled hand labor on the one side and ultra-specialized machinery on the other.

The British de Havilland Mosquito is mostly the result of hand operations, it is literally "manufactured," i. e. "made by hand." There are two great advantages to this from the British point of view. One is that there was a large supply of skilled wood workers in England when the war started. These men were *highly* skilled, with a long tradition behind them. But cabinet making is not a war industry, cabinet making as such does not do much for the war effort. If these skilled men had been put to work in any factory where metals are the raw material, they would not have been skilled workers any more. Put to work on wooden planes, working with materials and tools with which they are familiar, they could employ their skill in war work—and do it with a vengeance.

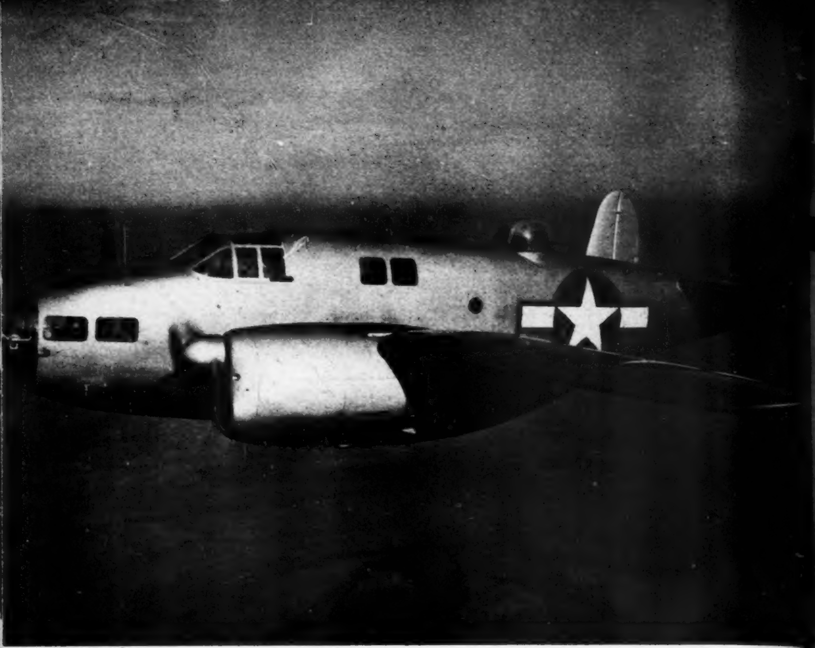
The other advantage is that the "manufacture" is not slow by any means because several people can work in several places simultaneously.

The British have found it advantageous to build the fuselage of the Mosquito in two halves, using flat plywood as a raw material. The sheets are bent—presumably by applications of heat—and the bulkheads and other internal parts are glued on. Then each half fuselage is wired separately until it is completed, often as many as six or eight people working simultaneously on each half. The final assembly then consists mostly of fitting the various large sections together, which includes the insertion of the non-wood parts, the engines

Fairchild Aircraft



Not a scrap of metal in them, fuselages of wood-fibers bonded by water-, rot-, vermin-, and about everything but bullet-proof plastic, wait final use.



Fairchild Aircraft

In the Fairchild "Gunner," an AT 21 fitted for training, the molded parts find their use. Rivetless, the plane is aerodynamically clean.

and the landing gear.

The reason for the wooden plywood planes of American machine-manufacture is not quite so simple. It would not be false to state that the aluminum shortage experienced during the first year of the war had a lot to do with the acceptance and subsequent production of wooden training planes. But it would not be true either. The aluminum shortage did play a rôle, but the processes developed by the Fairchild engineers for the purpose of producing these planes also represent genuine progress. And the research was begun at a time when nobody thought of a possible aluminum shortage.

To use the word "progress" in connection with wooden airplanes would have been permissible five years ago only if the statement had been of a negative sort. Progress in aviation was then taken to mean that you did not use wood any more. Just as on the high seas the admittedly less æsthetic but more

British-Combine

The British wooden ship of the air is a more vicious creation—the Mosquito, deadly as a bomber, fighter, or reconnaissance ship.

convenient and reliable iron ship replaced the more picturesque wooden vessel—to be replaced, in turn, by steel—so the all-metal plane had replaced the early wooden contraptions in the air. The early planes had been mostly bamboo even though some adventurous aviators tried steel tubing on occasion. Then wooden structures pushed the bamboo poles aside. And finally aluminum replaced the wood and everybody who liked to sound like an expert spoke of things like "stressed skin," "semi-monocoque" and similar things.

True, in the air things had been somewhat different. The new all-metal planes were not only faster, they also were sleek and shiny and gently curved all along the line—contrasting favorably with the old angular wooden crates. They were definitely "better," but it was hasty reasoning to credit the mere fact that metal was used with all these improvements. You can build angular lines and box-type fuselages of

British-Combine

The Mosquito is a hand-made beauty, assembled by expert cabinet-makers.

metal too, and some did. The improvement was mostly better engineering, the aluminum was not quite accidental, but only a contributing factor.

There is no need for an elaborate proof that the new wooden ships of the air, de Havilland's Mosquito and Fairchild's Advanced Trainers, are "good." The British flatly state that the Mosquito is the fastest plane in the air, not counting the jet planes. And the Nazis will testify that these wooden hit-and-run bombers are enormously annoying and should be *verboten* since one cannot even properly shoot at them. As regards the Advanced Trainers, thousands of our pilots and gunners have received their training on them and none of them was disillusioned by performance because it was "only" a wooden plane.

Obviously wood does have advantages in the air.

What are these advantages? And why is wood now suddenly fine when it was obviously bad a decade or two ago?

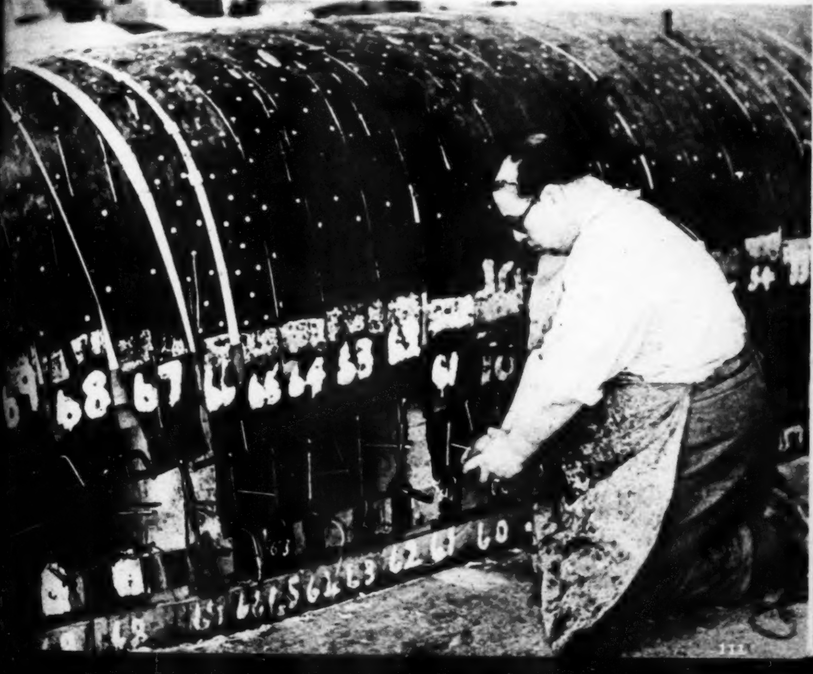
The main characteristics of wood—which may be an advantage as well as a disadvantage, depending entirely on circumstances—is that it is not "solid" in the same sense in which a slab of metal or even stone is solid. Wood is a substance that has not been deposited, it is a substance that grew. It has a cellular structure, it resembles, on a much smaller scale, a bathroom sponge, or "airfoam" rubber. Consequently it has less density than really solid materials which is the main reason why wood floats while most actually solid substances sink.

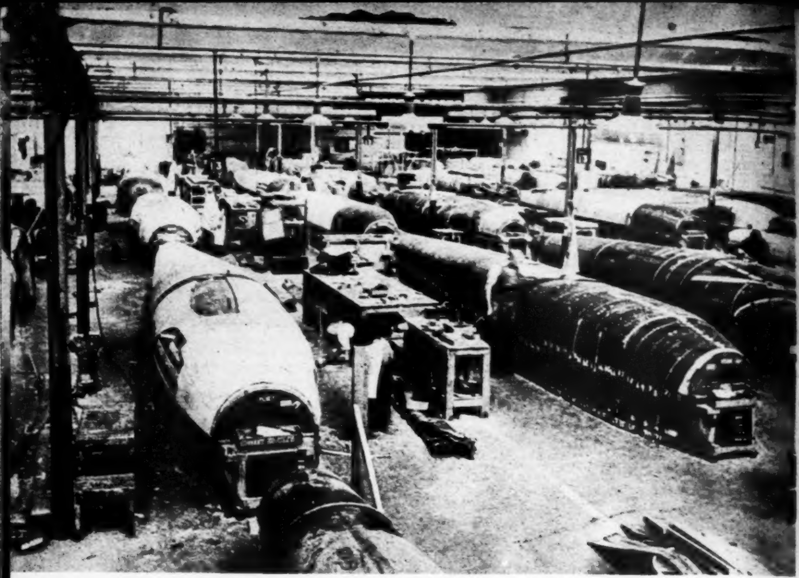
When the wood grew, it had the purpose of giving strength to the structure of the plant that produced it. The requirements of the plant are peculiar, it needs a great deal of strength in one direction, but not too much of it at right angles to that direction. Since Nature apparently knows only the two extremes of extreme parsimoniousness or reckless spending the decision, in this case, was in favor of thriftiness. Wood is much stronger in one direction.

Now comes the human engineer and looks at wood. He finds some things he likes. Wood retains its shape, just because of its cellular structure. If it sags—as in the case of a long pole supported only at both ends—it does not sag per-

Handbuckles hold the plywood, the pressure applied by skilled hands.

British-Combine





British-Combine

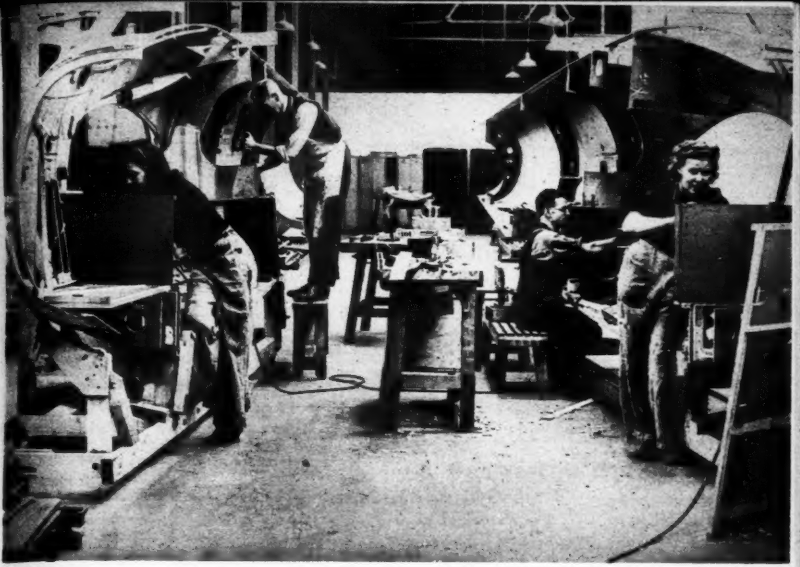
Scores of Mosquito fuselages in course of completion of the slow setting of the adhesive and the molding operations on the factory floor. The fuselage is made of separate halves, bonded at their edges in assembly.

manently as a piece of metal would. It is elastic too, not as much as spring steel but enough for ordinary requirements. That it is bulky for great strength is less good. That it is strong mostly in one direction is not too pleasing. And since it once grew it sustained injuries in the process, injuries with which the plant coped in its own peculiar fashion. To the plant these scars of former injuries are almost strong points when it gets through with them. To the engineer these things are "hidden defects."

We have one of the answers right now. Wood, at least as far as aircraft requirements go, is "bad"—*if you use it the way you find it.* (The early airplane builders did.)

But there is no reason why you should. Nobody ever uses pure iron, or pure copper, or pure aluminum for constructional work. The metals used are always alloys. There is no reason to use "pure" wood.

Granted. But how does one "alloy" wood? What are the other ingredients? The answer is that they are mostly wood too, wood from the same tree as a matter of fact. The first step consists of cutting the wood into thin slices. Doing this the "hidden defects"



British-Combine

The trick in making the fuselage in separate halves permits quick, convenient installation of all wiring, control cables, et cetera. A group of workers can stand and work conveniently on each half of the structure.

are invariably discovered and can be thrown out. What is left is good wood, still with cellular structure and low density, still with the property of being strong in one direction and breakable in the other. The latter defect is the easiest to eliminate, by laminating the sheets at right angles the strength in either direction becomes equal.

Yes, now we have plywood and plywood has played a rôle in the air for quite some time. Anthony Fokker, at one period of his stormy life, built plywood planes. There have been plywood transports in American aviation history, the early *Vega* was one of them, and there have been rather spectacular plywood planes like the *Winnie Mae.*

Plywood is a good building material for planes, especially for the outer surfaces. If a plane is to have high speed, there is one thing that is paramount in importance. The curve of the airfoil, say, which has been so painstakingly calculated by the aerodynamics man and which has been tested over and over again in the wind tunnel, must be properly followed. Else you lose four, six, eight, or even fifteen percent of the speed which calculation says you should have. That curve also must be maintained. And, just as important as the proper curve itself, the surface must be smooth. *Smooth* with a capital S.

For all these requirements plywood, good plywood, is actually better than metal. Of course you can get the proper curve with either of them, but as regards smoothness of surface and maintaining the curve wood wins almost hands down. Thin aluminum alloy skin, riveted to the wing structure, has a nasty habit which is called "tincanning" in aviation circles. The term is descriptive enough, the thin metal sheet, in the spaces between the lines of rivets, behaves like a tincan on occasion. Dents in this direction and in that. Dents which do not smooth out again. In other words: the proper shape, the mathematical niceties of the calculated curve, are not maintained by the thin metal skin. Plywood refuses to "tincan," no matter what happens.

Nor is the riveted metal wing perfectly smooth. The old round head rivets have been discarded long ago and flush rivets have been substituted. But every rivet—and it is a day's job to count the rivets in even a medium sized plane—interrupts the smooth flow of air just the same, even though to a much lesser extent. And after some wear and tear that condition gets worse. Not enough to make the plane unusable, far from it, but enough to cut down two miles, or three, from the speed it should have and did have when brand new. There are no rivets in plywood. And the plywood surface can be polished to shiny brightness, it can actually be made smoother than the average metal surface.

To this add one engineering convenience. The thin metal skin of modern planes, especially the outer skin of the tail assembly, is much too thin to maintain its shape all by itself. It needs an internal structure, it needs stiffeners. Plywood, because of its lower density and its cellular structure, does not need stiffeners. Once bent into the proper shape it stays in that shape. It is thick enough to be stiff, but because of its essentially spongy nature it does not weigh more.

As a matter of fact the strength/weight ratio of modern varieties of plywood and of the structures made of them is just about the same as that of modern aluminum alloys and the structures made of them. So the advantages just recounted are really advantages and are not counter-balanced by greater weight.

There is another possible advantage at this point. You may have a piece which has to be much stronger at one end than at the other. And for reasons of design you may want it to be of uniform thickness, or at least approximately uniform thickness, throughout. The problem can be solved with plywood and plastic glues: you can build up a shallow pyramid, with more wood piled on where the strain will be greater. Then the whole can be compressed to uniform thickness, producing higher-density plywood at one end and lower-density at the other.

While this has been done—and successfully done—the method is not used in the two planes under discussion. The Mosquito is not fitted with such parts, nor do they appear in the Fairchild Advanced Trainer. As a matter of fact the Fairchild engineers pride themselves on using low-density plywood throughout, on having practically no interpenetration of wood and glue and they are expecting new processes in the future which will permit even lesser general densities than they are using at present.

At any event it can be seen that wood is a rather versatile material, permitting at least as many variations as metals do, with similar results, but through different kinds of handling.

Naturally where there is so much light there has to be some shadow, too, and here the shadow amounts to this: plywood is good only as long as it holds together. Plywood is only as good as the glue used to change the thin sheets of natural wood into what I called the "alloy," the lamination combining the strong points of natural wood without its defects and weak points.

We now enter the field of plastics because the glues used belong to the group of substances that are called plastics. Because of those plastic glues the public often refers to those planes as "plastic planes" which is something that simply does not exist. Most airplanes now have a lot of parts made of plastics—the transparent noses of bombers, for example—but to call the plastic-bonded plywood planes "plastic planes" is simply wrong.

Part of the trouble is that the term "plastics" itself is a poor name for what it is supposed to describe. The word makes one think of something like putty, what you do get is a hard substance of more or less glassy appearance. It may look transparent like clear glass, or like colored glass, it may be a thread or a bristle like nylon, it may be a darkish substance like bakelite, but it never is really "plastic." What the word really means is that these substances were plastic at one point during their manufacture, that they were formed when in the plastic state. But unless you work in such a factory you never see a plastic plastic. It is a poor word, but it probably is too late to do anything about it.

There is a slight hope that the word "synthetics" may replace the term "plastics." If that comes to pass it will be something to be grateful for, because "synthetics" really means something without misleading innocent bystanders. Incidentally, English would only follow the usage of other languages if "synthetics" were adopted. In French these manufactured molecules of so-called plastic substances are referred to as *résines synthétiques* and in German they are called *Kunstharze* which also means "artificial—synthetic—resins."

There are by now literally over a thousand such "synthetics" in use and the strange part of it is that so far hardly a single one of them has become obsolete. A newer type may replace an older type for some specific purpose because it is better suited for that particular thing, but the older type survives too, possibly in a more specialized field, but it survives. It may also be mentioned here that the science of plastics is not as new as most people imagine. Actually the majority of the substances now in use are known to chemists for more than half a century and a substantial number for longer than that. Polystyrene, for example, much in use right now for half a dozen important purposes, was made for the first time by a chemist by the name of Simon in 1839. That was just eleven years after Friedrich Wöhler, by synthesizing urea, had laid the foundation not only of the whole industry but also of organic chemistry in general.

What is new about synthetics is that industrial chemists have found ways and means of producing them in quantities and that industrial engineers have found a sufficient number of uses for them. The substances themselves are known for a long time—of course with some notable exceptions of which nylon is the most famous and most in demand.

Although there are so many synthetics they can be classified quite easily into about a dozen "families," according to their chemical nature. The hundreds of trade names under which they are listed in the catalogues of the industry are just the names of the many members of these "families," sometimes a single member may go under more than one name if manufactured by more than one firm or used for different purposes.

But still more easily can all the synthetics be arranged into two large groups: the thermoplastics and the thermo-setting plastics. The members of the first group, the thermoplastics, all behave like sealing wax. When cold, they are hard and virtually unyielding. When heated, they are actually plastic and can be shaped at will. And, if one piece did not turn out well, it can be re-heated and re-shaped; in that respect the thermoplastics resemble metals. The solidifying by lack of heat and the re-softening by re-heating can be repeated as often as you please. The only thing that will disturb the performance is that there might be too much heat, so much heat that the thermoplastic is chemically changed by it.

The members of the other group, the thermo-setting plastics, behave more like dough. They are plastic when mixed and can be shaped at will. Then they are heated and become solids. And that is that. No amount of re-heating will make them plastic again, once they have been "cured" and have "set" they stay "set."

Now if you want to glue wood sheets together for plywood for aircraft you have one fundamental choice. You can select either a thermoplastic or a thermosetting material. In the first case you have the advantage that the section you glued together will harden normally just by cooling off, much in the manner of a metal casting. In the second case you get a very durable and permanent piece, but you have the trouble of curing it to make the synthetic "set," and that can be very difficult on occasion.

Both varieties of synthetic glues have been used and both still are in use. The glue that holds the Mosquito together is a thermoplastic glue, in fact it is a casein glue which for some time had a rather poor reputation. There is nothing wrong with the properties of casein glues, as far as strength goes they are excellent. But casein is derived from milk. The chemical changes that go on ruin the substance from the viewpoint of edibility as far as human beings are concerned. But bacteria feel differently about it. If they can get in, they do and thrive and multiply. Casein-bonded plywood was subject to a kind of trouble very similar to the trouble construction engineers were once experiencing with steel tubing. The tubing would still look good and have every appearance of strength after a few years—but it would be quietly rusting from the inside. The casein-bonded plywood would appear fine and strong—but inside bacteria would busily eat glue and grow and split in two and increase the glue consumption.

This is one of those problems that are problems mainly if you don't know that they exist. The fact is now known and the British do something about it. They apply surfacing constantly with loving care and are more successful in keeping the bacteria population out than anybody would have dared to prophesy. Built by hand and cared for constantly by hand the Mosquito flies and is one of the most successful planes of the war.

It almost goes without saying that the American engineers decided in favor of a thermosetting plastic glue. Chemically its nature is such that no bacteria, even under duress, will consider eating it. Offhand it all sounds much nicer, the difficulties are in engineering procedure in such a manner that it can be used in production. The finished pieces should not be just flat plywood, they have to show the proper shapes and curves. So the wood has to be molded under pressure. Shaping the piece and "setting" the glue should, preferably, be done in one operation. And since the glue is thermosetting there is absolutely no room for mistakes. While you are writing specifications you may as well add that the pieces should be made as large as possible, a whole wing section, a fuselage bottom, a tail assembly.

It can be done, but it took some research to do it. The finished process is now known in aviation circles as the "Duramold Process" and it has attracted enough attention to send British commissions across the Atlantic to study it.

This is how it works: The thin wood veneers, as narrow or as wide as the tree that produced them, are glued together at the edges only, forming larger sheets, up to ten feet wide. In doing this attention is paid to the natural grain of the wood, the veneers are arranged so that their grain runs parallel. Then the veneer panels—or, if the natural width was sufficient, the veneers—are cut into the irregularly shaped pieces which will fit the large metal dies, the actual molds into which the wood will be "poured" under pressure. Meanwhile sheets of plastic glue have been cut into the same patterns. When the mold is covered with one layer of veneer, one layer of glue sheet is placed on top of it. Then another layer of veneer, with grain running at a Right angle to the grain of the first layer. Then another layer of glue sheets. And another layer of veneer, again at right angles. That goes on until the whole is as thick as specified by the design engineer, it may be only four layers of wood in some places, it may be up to a dozen in other parts.

Now the whole thing, the metal mold as well as the multiple wood and glue sheet sandwich, is covered with a carefully tailored rubber blanket which fits snugly. The blanket is clamped on all around and then the air that was caught under the rubber blanket is exhausted by means of air pumps. The purpose of this is easy to understand: the whole thing will be put under pressure, if there were air pockets under the blanket that air would take up some of the pressure, the structure would not be compressed uniformly.

At that point the assembly is ready for the "oven," a huge tank of tough steel, fitted with steam pipes of large capacity. As soon as the door is locked live steam is let into the oven, rising to one hundred pounds per square inch within ninety seconds. This pressure, acting through the rubber blanket—which, however, prevents the steam from touching the wood and glue directly—forces the sandwich tightly into the mold. Since the pressure is supplied by steam and not by a mechanical piston or roller, it is distributed in perfect uniformity, each square millimeter gets as much pressure as every other, no more and no less.

Simultaneously the sandwich is heated by the steam, the plastic glue really becomes plastic but begins to "set" at the same time. The temperature used is around three hundred degrees Fahrenheit, the period for which the piece is cooked varies from fifteen minutes to a full hour. Then the pressure

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is released, the door opened and the piece wheeled out and taken from the mold. And what had been a jig-saw puzzle of irregularly shaped pieces of wood with alternate layers of glue sheet pieces only one hour earlier is now a fused and molded mass, as much one piece as a bowl carved from a single piece of amber, only much stronger. The remainder is simple assembly.

What happens when the piece is too thick, like a spar, for example? The steam would supply pressure all right, but wood is a poor conductor of heat and the pieces of glue sheets an inch or more from the surface may not get enough heat for proper curing. Of course you could use casein glues for such thick pieces, but uniformity of glue is preferred as can easily be imagined. You also cannot go too high in temperature. Wood contains moisture and you might get small steam explosions in the wood. The limit to which you can go seems to be around two hundred thirty degrees Fahrenheit at atmospheric pressure, a little more under higher pressure. The glue selected is one which sets between two hundred and two hundred thirty degrees Fahrenheit for this reason.

The engineers called electricity to help in such cases. Wood does conduct electricity if high frequencies are used. The ranges from fifteen thousand to eighteen thousand volts at about three million cycles, and from three thousand to four thousand volts at fifteen to twenty million cycles were found useful. This electric curing was one possible method. Another was found by utilizing the fact that a wet glue line conducts electric current somewhat better than wood. In that case a slight excess of glue was used so that it squeezed out at both ends to come into contact with the electrodes. The result was the same, the glue was cured, but the adjacent wood was hardly even heated.

There are now about half a dozen methods of producing such wood and glue "alloys." Next year, or two years from now, there will be twice as many, the whole science is still in its early stages. But what has been done so far is enough to prove that wood is making a comeback into aviation. And it is quite likely that wood will be the routine material for small size aircraft—anything below, say, ten tons—after the war.

THE END.

NEXT MONTH —

Theodore Sturgeon's back—and with a whale of a novelette!

"KILLDOZER!"

The story of a handful of men trapped on a tiny island with a mad bulldozer!

IN TIMES TO COME

Theodore Sturgeon has been missing for lo, these many months. The Army turned him down, the Navy turned him down—but he's been building Navy bases. He's been living with and working with those giant earth-movers, the bulldozers and power shovels, dumptors and other mechanized equipment of the warfare against earthy inertia. He got to know them, and their brutal, stubborn, and terrible strength.

There's nothing subtle about an ordinary bulldozer; it doesn't lift earth and rocks out of the way—it bulls its way through them by sheer, slogging power. It can't climb trees—but it can walk the length of a tree trunk by pushing the tree down.

It's a blocky, massive epitomization of pure, un-subtle brainless power. That is—the ordinary bulldozer is.

Daisy Etta was different. *Daisy Etta* was the name they gave the 14-ton massive chunk of power before the *thing* gave *Daisy* an intelligence of a sort. Low-grade intelligence, true—but it had only one thing to think about, and it did that all the time. Killing men. There were only a handful of men, but they were practically trapped on the tiny island with *Daisy Etta*—with fourteen tons of crafty, ungovernable, almost unstoppable hate!

The yarn's called "Killdozer." It's a yarn with the drive and power of a bulldozer itself, too. It'd be a real mistake to miss it.

THE EDITOR.

THE ANALYTICAL LABORATORY

The July issue of Astounding was, of course, unique among all the issues the magazine has ever had—the only one that ever contained fewer than five items of fiction. Reasons, of course, were easily found—"Renaissance" was really long, and we carried two articles. (Willy Ley's item on the cockeyed torpedoes various people tried to make before the present type was worked out, and Richardson's article on names of Lunar craters.) "Renaissance" turned out, as you know, longer than expected, which is why it finishes in the current, instead of the last, issue. But from the looks of these Lab figures, you agreed with my feeling it was worth cramming in!

Place	Story	Author	Points
1.	Renaissance	Raymond F. Jones	1.0000
2.	Huddling Place	Clifford D. Simak	2.45
3.	Thought	Fritz Leiber, Jr.	3.00
4.	Utility	David Anderson	3.20

"Renaissance" got a straight, solid and unanimous first-place vote. Incidentally, "Thought" didn't get a unanimous third-place vote; the figures happened to work out even.

THE EDITOR.

Freysling was a swell guy; agreed. But those who knew him very long found he had a most disturbing and unorthodox—persistence!

The Case of Jack Freysling

by THOMAS CALVERT McCLARY

Illustrated by Williams

We were casualties, sitting around the convalescing station at Darwin, waiting for odd pieces of ourselves to patch up. We had a lot of time on our hands for talk, and one of our favorite lighter themes, for some reason, was the latest list of known dead. There was nothing morbid in this. It simply held common interest. Maybe it's that a fellow likes to know who is waiting for him at the other end if he has to hit the sky trail.

Jeff Lambert was reading off the morning list and suddenly stopped. He looked up, and around at the five of us, one by one, and said, "They got Jack Freysling in the Solomons."

We fell into that suspended silence of recollection. All of us had known Freysling, a wild, wacky galoot who had turned down a good exempt job at home to join up as groundhog with the flying jeeps. I recalled him with flaming red hair, a voice like an organ, and the light of sixteen devils in his eyes. He had somehow acquired a love interest after hitting the island, and had not only been darned near butchered by the Japs, but very nearly court-martialed for sneaking through the lines one night.

There are some men whom you decide will have no number until they get to be at least ninety-four. Jack was that kind, and so it was something more than sadness that moved our silence. It was outright surprise. You simply could not think of that crazy coot being dead.

I was thinking that for about the tenth time when I heard Bill Hay chuckle. I looked around at him, and he was enjoying high humor, but he wasn't out of his head. I said pretty sharply, "That must be funny! I thought you were friends back home?"

"He isn't dead!" he scoffed. "You can't kill that bird!"

Jeff said soberly, "They don't make mistakes on these lists, Bill. They're careful not to list a man until they know for sure."

"Oh, they probably found his body, all right," Bill agreed. "But they've found it four or five times before that I know of."

Jeff peered at him intently. "You all right, boy, or has that wound got you?"

"I am all right," Bill nodded adamantly. "But it wasn't the first time Jack died, I can tell you! It was the time after he committed suicide."

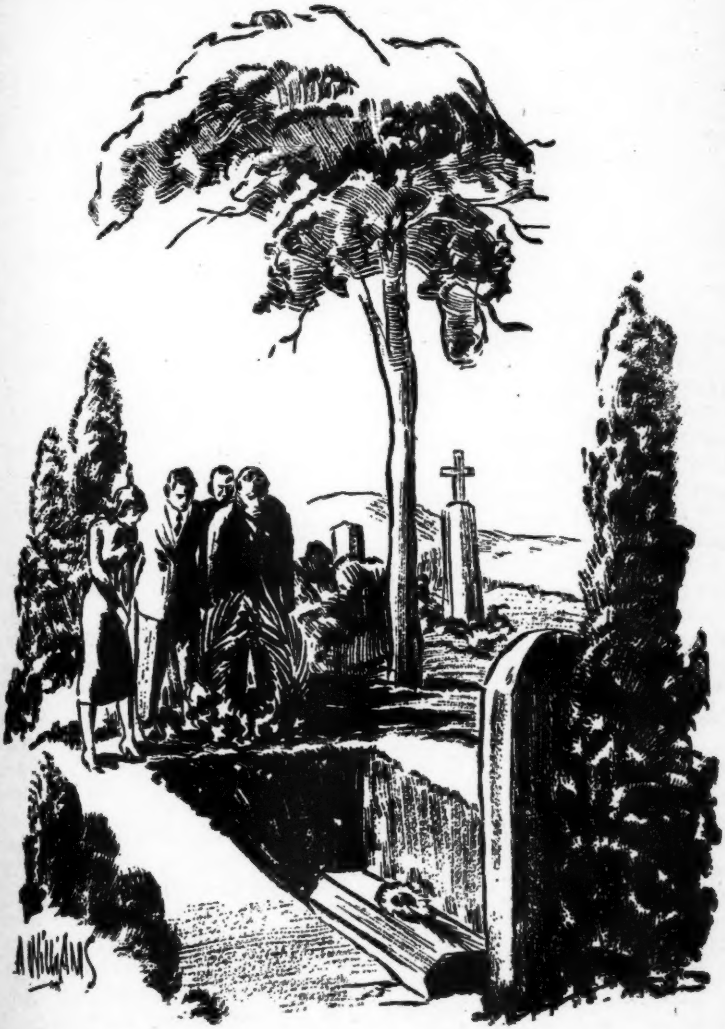
Now Bill was one of those good-natured, but exceedingly accurate and literal guys who never put a quarter inch on anything. When he said visibility was six and a half miles, it was six and a half, and not three quarters. So we gave him more attention than we might have another of the crowd.

"It was this way," Bill said. "I had palled around with Jack for about five years in nearly every part of the country you can think of. I was on a transcontinental flight, and kept getting special duty to off-the-route airports for some reason. It gave me layover time at a lot of strange ports, big and little. And almost any time at any of them, I was liable to run into Jack.

"He was a newspaper feature writer and he was always buzzing off on some wild yarn, half the time of his own concoction. Sometimes these jaunts and his wayward habits would land him in difficulties. I guess I bumped into him under about every condition there is. One time he would be in jail, the next time, just getting out of a hospital, the next time with a six room suite at some swanky hotel. He was just that kind of mug. You expected it of him.

"He had a serious streak, but he kept it well hidden. It was three years before I knew he had anything in him but a devilish twisted humor to involve everyone he knew in some jam. Then one night I broke the ice and discovered this serious side of him. I didn't know until then that he had ever been married. But he had been, and had a daughter, and it turned out she was all the world to him.

"Well, this daughter had been ill almost since birth with some malady that no doctor could name. Jack had used every connection he had, and I guess his family had money


A Williams

to boot, to get this kid cured. They had taken her to at least twenty specialists in three or four countries, but the kid was still sick. I won't forget the way he looked as he told about it. When he finished, he gave me a long, intent look, but somehow as if he were way out in space and looking at me from there. He said, 'Bill, that kid can be cured, and I am going to find out how. But if she isn't, if anything ever happened to her, I'd bust out of this world fast!'

"He was serious enough, but a man is liable to think those things himself at such times, and I never gave it a second thought until he committed suicide. That was in New York in 1939, and brother, there was no mistake! He left a note saying what he was going to do in his hotel room. He paid his bills, and for about two weeks, made a point of seeing his friends. He gave no sign of what he had in mind, and that was why they were extra careful to make sure that it was Jack. When the time came, he went up atop an office building and jumped.

"The fall smashed him up pretty badly, but it didn't hurt his face or one hand. He had destroyed all identity on him, and that was the reason for the first check. They had to find out who he was from his fingerprints. There wasn't any doubt of them, but to make sure, they had five people identify him at the morgue. I was one.

"Now there wasn't the slightest possibility that it was not Jack. I saw him, and looked at him a long time, and he didn't look any different than he had a month before. It was Jack Freysling and nobody else. In the course of time, they found his ex-wife who identified him again. She said she was not surprised. She let it go at that, but I found out the kid had died only a short time before.

"That was in November of '39. In February of '40, I went to Rio for a special job. I was cooling off with some frosty drink at the Continental when Jack walked in. He walked smack up and stood beside me and ordered a drink. I said something dopey like, 'You can't do this. You're dead!'

" 'Oh, again?' he grinned.

"I got pretty stiff. You begin to think you're nuts yourself when something like that happens, and pinch your own hand and things. I must have gone over the whole thing a dozen times that night with him, but I couldn't get anything but amused remarks out of him. The next morning I decided I had been just plain cockeyed drunk, or touched with some jungle fever. But he was registered in the hotel.

"I saw a lot of him for two weeks, and the thing worried me so much I stole his fingerprints and sent them back to New York. A friend got in touch with the police, and in the course of a few days wired back, 'Fingerprints belong to a Jack Freysling who committed suicide here in November. Are you carrying around a corpse?'

"I wasn't sure myself, but I readjusted my life and had about gotten used to living with an unsolvable mystery when he got killed in the mountains back of Rio. He was shot by accident on a hunting trip, a clean shot right smack through the heart. They brought his body down, and it was his and no mistake. Just for good measure, the consul sent up his fingerprints, and got his identification back. They couldn't locate anyone related to him nearer than a cousin who cabled them to bury him down there. He was buried in Rio, with half a dozen people who had known him in years gone by, taking last view of the body and attending the funeral. I was one.

"To tell the truth, it was a relief in a way. There is something darned creepy about talking and drinking with a man you know is dead!

"Well, that was near the end of April. In October I was driving up Santa Monica boulevard in Los Angeles when a voice like a loudspeaker hollered at me to pull over. I did, automatically. I don't know that I was exactly afraid, but it was something close to it; an unexplainable fear that it would be Jack Freysling. It was. A car pulled up behind mine, and he got out, and came up grinning and whacked me on the shoulder. He had the devil in his blue eyes as he looked at me, and he stood there and asked, 'What's wrong with you, Bill? Bring back some of that jungle fever from Rio?'

"Well, we went and had drinks and went through the same thing all over again. If he was real, he had been in Rio. He had seen me there, and he recalled precise things we had done together in every detail. He admitted going off on that last hunting trip. But when I spoke about his death and identification and funeral, he simply grinned. When I tried to pin him on it, he'd come out with some crazy remark like, 'Boy, I'm always dying!'

"I saw a lot of him as usual for a week or two, but this time, it was getting me. I went to three different alienists to be sure I wasn't crazy! I even took him along to one. I'd go to bed dog-tired, and waken in the middle of the night in a cold sweat and wondering if I was crazy. We lived at the same hotel, and I'd go running, and pretty near yelling, down to his room to see if he was still there, and in the flesh.

"You can't fly a passenger plane in that condition, and without telling the boss why, I got switched onto freight flying. In the meantime, I stole his fingerprints again. I got them, and a dozen snapshots of him, and I checked in New York and Washington and Rio. It was Jack Freysling beyond a doubt. It was the same Jack Freysling who had jumped from a roof in New York, and been shot in the mountains back of Rio.

"I was on a flight east when he went up to Alaska on a story about the fishing industry and how it was being crowded and pirated by the Japs. While he was writing the story, he went overboard in a rough sea and was drowned. They recov-

ered his body, and there was, no mistake. They shipped it down to Seattle, and his boss in New York flew out to identify it. He had heard about those other deaths, and I guess he thought of them, but Jack was the kind of guy who was always getting involved in weird predicaments, and then building the stories up. The boss probably thought the other deaths had been hoaxes. This one was real. He had known Jack since he was in high school, and as well as face and fingerprints, he identified a ring and birthmark. I wasn't at that funeral, but I later saw people who were, and they knew for certain the body was put into the ground.

"I had just about got over this when I went to London in the middle of '41. I was sitting in what was left of Claridge's when Jack Freysling walked in wearing a bomb helmet. I didn't say anything. I just stared at him, and felt the ice doing a machine gun act through my veins, and waited for him to talk. He ordered a drink and stood there chuckling a while, and then said, 'Surprised? Suppose you thought I got washed out in Alaska?'

"I spent three terrible nights and days, and the bombing of the city didn't mean a thing. It was Jack Freysling being alive that got me. I have sat hand-in-hand with death a dozen times, but I have never felt the cold, maddening fear I felt then. I couldn't stand to see him, but the moment he got out of sight, I'd go almost hysterical until I caught up with him again.

"You can stand just about so much of that, and then one of two things happens. Your mind accepts what it can't understand, or it cracks and you go nuts. I was lucky, unless I'm actually in a nuthatch thinking all this now. My mind simply accepted it. I settled down to being rational again, and accepting life as it came. Jack Freysling's mystery was something I put aside, and knew was there, but did not try to solve. Except for this. I did repeat the fingerprint business, and the man with those fingerprints had been buried in New York, Rio, and Seattle!

"I went back to the States in company with Jack, and I was with him the night his old boss walked in on him at dinner. This was the man who had identified and buried him in Seattle. The poor man turned ash-white, but he did sit at the table. He sat down and ordered, and midway of the dinner he leaned over and felt Jack's jaw. Then he said very quietly, 'I've gone crazy,' and passed out on the floor. The last I heard, he was quietly but completely screwy.

"About a month before Pearl Harbor I was in Chicago and picked up the paper to see that Jack Freysling, the feature writer, had been killed in a South Side gun brawl between two gangs. Apparently, he was following up some story. I tried to get out of town before I saw him, but too many people knew I knew him, and I got roped in. I had to visit the morgue, and identify him. It was easy enough. His face never changed. Beside, they had those fingerprints.

"By some stroke of fate, his hearse was smashed by a train en route to the graveyard. The coffin and everything else was smashed wide. It involved insurance, and they had to check everything again, and this time about all that was left of Jack were his fingerprints. But those were enough, and so they put his remains in a basket and buried them. I thought to myself that this time, he was really through, and I was released from that haunting mystery. There might be some explanation, some trick, of a man reappearing after his supposed death if his body was intact. But this time his body had been chopped into a hundred pieces.

"Well, then there was Pearl Harbor and all of a sudden we had more to worry about than our private lives. I was called up, and shipped out to the Pacific pronto. I had been flying out here about two months when I was transferred to the outfit we were all in. We flew over to join the row in the Solomons, and coming down on that field that first afternoon, I saw a big, wild red-head beside a hangar. Before I even got out of the plane, I knew it was Jack Freysling. It was, grinning and shouting, 'How's Chicago?' "

Bill Hay stopped and lighted a cigarette, and then looked around the circle of faces with an ironic grin. For a moment, he sat there chuckling softly before he said, "So you think the gremlins have got me? Well, boys, you'll find out. One of these fine days, you'll bump into Jack Freysling again!"

Personally, I agreed one hundred percent with the gremlin part, but not the part about Jack Freysling. There is something uncomfortable about being with a crazy man, even if he's been a buddy and a friend, and after that, I kept pretty much out of Bill Hay's way. I recuperated, and got back into action as an observer, and then we were knocked out. Our plane was badly hit, and we came wobbling into the home field, and just before landing, went off on one wing and crashed. They got us out before we fried, but I was pretty well blistered up, and had the good luck to get shipped back to the States for discharge and recuperation.

After a while I was able to get around and Broadway looked pretty good, believe me, after those deserts and jungles! I had gone to a show one night and stopped in at a restaurant afterward for a steak. I was just about to bite into the first dripping mouthful when I heard that organ voice. It was Jack Freysling, and he sat down grinning, and said, "This has got the Solomons licked a dozen ways!"

It was a kind of dull jolt, like the kind of blow that knocks your wind and senses out, but doesn't hurt. Maybe that last crack-up had done something to my sense of shock. I was surprised, but not as much as I should have been, and after a long piece, I asked, "Are you alive?"

"As much," he grinned, "as you."

That was a heck of a thing for him to say, because it got me to thinking maybe I wasn't. Maybe this was some particular sort of Hades or something. And so I did what Bill Hay had claimed he did, I stole Jack's fingerprints and checked them. I learned from the War Department that he had died in action, and from the New York police that he had committed suicide, and from the Rio authorities that he was buried there, and from the Seattle undertaker I got the location of his grave. He was also duly recorded as dead and buried in Chicago.

By a little hocus-pocus and at considerable cost, I got these graves looked into. Excepting for the war, I am afraid I would be in a first-rate front page scandal. No remains were found in a single one of those graves!

There is no use trying to get anything out of Jack Freysling on the matter. His eyes simply fire up with those devilish lights and he says airily, "Oh, I die every now and then!"

I have been to several alienists myself on the matter, and had other old friends of Jack's identify him. I believe one or two have landed in the nuthatch as a result. The others won't even mention him out of fear that if they get to talking, they will go there, too. Personally, I have now settled down to the attitude Bill Hay took, and I can understand it now. It isn't possible, but it's so. Jack Freysling has died a number of times, but he is going to meet me, nevertheless, in twenty minutes for dinner, unless he has died again by then. He called up awhile back to make the date. He said his little daughter was with him, and he had promised to show her a real battle ace.

I am going to take a very stiff drink, and then go and meet them. I am very curious about the daughter. This daughter is the one who died, also.

THE END.

Case of Apparent Time Acceleration

by R. S. RICHARDSON

Although the professors of science-fiction are always inventing time gadgets which inevitably lead to trouble with citizens and taxpayers of the past and future, in reality this is a field of research that is utterly neglected by flesh and blood investigators. It is true that time as a variable is a commonplace in theoretical physics, where it is regarded merely as an extension to ordinary three-dimensional space. Indeed, theoretical physicists generally feel pretty cramped in four or five dimensions, and find it necessary to operate in a space of 6, 7, 8 .. ... n.. dimensions.

But speculations upon the nature of the time stream *as such* are extremely rare in scientific literature. Hence, the extraordinary interest attached to a recent note in *Science,* official publication of the American Association for the Advancement of Science, on the "Apparent Time Acceleration with Age of the Individual." The note by F. W. Nitardy, a chemist, has already aroused considerable discussion among scientists.

Dr. Nitardy offers an explanation of the familiar experience that time shows an apparent acceleration with increasing age. While there are naturally individual differences, as a general rule a year during our early childhood seemed to extend over an incredibly long interval. A year during our twenties was longer than one in the forties. In old age the years seem fairly to fly past us.

His thesis is that time seems long or short according to the individual's total time experience. Taking the year as our unit, consider its apparent length to a child of eight. The child's total time experience is probably about four years. Therefore, a year represents twenty-five percent of his total experience. For a child of twelve, if his memory goes back over eight years, then a year corresponds to twelve and one half percent of his total experience. On this basis, a year should seem roughly half as long to a child of twelve as one of eight.

Similarly, at twenty a year would be about five percent of the total time experience; at fifty-four, about two percent; after seventy, only a trifle over one percent. Thus with the passage of the years, time would show an apparent acceleration.

If we call D the "duration" of a time interval such as a year, then expressed in percentages, $D = K\,100/(T\text{-}a)$, where T is the individual's total age, and a is a constant which here has been taken to be four years. The factor K is inserted as a sort of safety factor to allow for personal peculiarities and numerous other individual characteristics.

This idea has proved unusually stimulating in scientific circles. Do science-fiction readers have anything to contribute? Can you devise a better formula than the simple one given here? Or don't you think the idea has much to recommend it?

PART IV.

Renaissance

by RAYMOND F. JONES

***Conclusion.** The strange, walled-off world of Kronweld regains contact with Earth—through the flame-shot gateway of War. But the great problem Kronweld had been intended to solve was answered.*

Illustrated by Orban

SYNOPSIS

Defying law and tradition of Kronweld, Seeker Ketan makes forbidden research into the origin of life. Using animals, he learns the startling facts concerning their reproduction and suspects the existence of parallel circumstances in human reproduction. Kronweld knows only that life is created within the Temple of Birth. Condemned for his blasphemy, Ketan enters the Temple in woman's guise to find out its secrets.

In the same group of entrants is Elta, Ketan's companion to be, who enters for unknown purposes of her own.

Ketan finds the secrets for which he came in the Chamber of Birth when he witnesses the creation of life. It consists of the sudden appearance of an infant human amid great blinding flames. But through these flames Ketan catches a glimpse of a vast multitude that gives the impression that the flames are no more than a Gateway. Against Elta's violent protest, he determines to enter those flames at the first opportunity.

A schism within the Temple results in the death of Matra, leader of the Ladies, who had previously warned Ketan of some great danger to Kronweld which she identified as the Statists. Dying, she gives Ketan and Elta assistance in planning an escape.

Their plans are thwarted by Anetel, the new leader, however, and Ketan is condemned and forced to pass alone through the flames.

All his life he has held a vision in mind of a great pinnacle of rock in a barren desert which seems to draw him with some mysterious, irresistible force. As he passes through the flames he has the fleeting impression that he is going to that pinnacle.

He regains consciousness in the midst of a strange forest and there makes contact with a group of primitive savages who call themselves the Illegitimates because, as they say, they have no right to live.

Among them he learns that his theories of human creation were correct, which fact comes with a realization that is horrible to his Kronweld-conditioned mind.

He also discovers that his people have come from Earth to Kronweld by means of a machine called the Selector. This machine is controlled now by the ruling group of Earth, the Statists. The machine has for twelve centuries selected out the technically and scientifically endowed intellects and transported the infants possessing them to Kronweld. Ostensibly, the machine's purpose has been to eliminate criminals. Law requires the submission of all new-born to the Selector, but the Illegitimates are those who have fled to the forests and plains and refused to be submitted or to submit their offspring to the machine.

Among the Illegitimates Ketan finds a man who knows of a place similar to the pinnacle and desert of his visions. With his aid, and in company with the leader of the Illegitimates, William Douglas, Ketan locates the pinnacle.

There they find a vast library and museum, and they learn that an ancient scientist, Richard Simons, and his followers, seeing the approach of a great Second Dark Age upon Earth, prepared the Selector to segregate the scientific minds that would be born during the dark era. Coupled into the Selector were other circuits designed to impress the necessity for return to Earth upon one or more brains of sufficient calibre to lead the Kronweldians back to Earth if and when conditions would permit.

Ketan was so impressed, but he was not the first to come back. He learns that many others, under the *leadership of Igon, an almost legendary iconoclast of Kronweld, have returned and formed a group to promote the return to Earth. Ketan is directed to contact the group, but he finds no clue to their present existence or whereabouts.*

Returning from the pinnacle, he finds the Illegitimate village in commotion over a captured Statist whom they are about to burn at the stake. Their victim is Elta.

Ketan rescues her from the mob. She later confesses to him that she is a Statist, that her purpose and that of Hoult and Daran has been to send back to Earth the scientific discoveries of the Kronweldians. Leechlike, the Statists learned of Kronweld's existence more than two centuries ago and have thus fed upon those segregated intellects ever since. Now, fearing the power of Kronweld, the Statists have formed a plan to wipe out Kronweld as soon as proper atomic weapons are prepared.

Elta reveals that she has revolted against this cruel plan and is going back to the Statist city of Danfer to destroy the Selector thus cutting off the worlds forever. She is adamant and vows to accomplish this, opposing all Ketan's efforts to bring his people back.

Ketan fails to persuade her that Kronweld must return. She says they are not fit to rule Earth as Richard Simons planned because of their conditioning in the alien Kronweld. She believes the Statists would destroy them with ease and considers it an act of mercy to close the Gateway and let them die of their own sterility.

Elta slips away from the village in a captured Statist aircraft; Ketan, knowing she has gone to the Selector to destroy the Gateway, realizes he can't overtake her by horseback—the only transit available at the village—so goes again to the nearby pinnacle, and there obtains one of the ancient, enormously efficient aircraft. With that he reaches the Statist city—but is captured by the Statists, and taken before the Director.

The Director lives in a test tube, a half-man, half-machine creature, blinded, paralyzed, half destroyed in a long-gone laboratory explosion—yet kept alive and able to act through machines based on Kronweld-discovered principles developed and applied by Statist workers. Electronic eyes, ears, and voice serve him; electronically amplified nerve impulses power various devices he operates. And from his test tube the Director can see equally well anywhere in any Statist city—or in Kronweld!

The Director mockingly tells Ketan precisely what they plan to do: gigantic atomic projectors are being mounted to blast through the Gateway, to destroy Kronweld—and Ketan is to be sent back to Kronweld with that information. The Director knows Kronweld—knows it will not believe, but will condemn Ketan to death for having violated the Temple of Birth. And just after the Selector has thrown Ketan through the Gateway, Elta reaches it, and destroys *its apparatus—but only, it develops, unimportant secondary supply circuits, damage that can be rectified in a few days or weeks.*

Ketan, precipitated into Kronweld, is indeed condemned to death—the Director knew the Kronweldians well—but escapes, with a friend, Varano, into the Dark Land. Varano guides him far into the "unexplored" area, to a city that Kronweld had never known about—a city of Kronweldians who, like Ketan, had been condemned and escaped, or fled otherwise—a city established by the great, legendary Igon, and others who, like him, had been drawn through to the pinnacle.

Here, vast defense devices, designed to protect Kronweld against the attack of the Statists, have already been designed and built under the leadership of Hameth. Ketan quickly fits into this organization, and is made Hameth's second in command. Then, while practicing with one of the gigantic atomic-powered mobile forts—a sort of stupendous super-tank—Ketan sees Hameth suddenly dart out from behind a pile of rock and throw himself under the monstrous machine. Ketan, horrified, climbs down to investigate—and finds that Hameth was a structure of metal, glass, and tubes. Igon, the legendary, Ketan realizes, has been alive and active in this synthetic body, and, by his final suicide, turned all of the problem of Kronweld, Earth, and the Dark Land city over to the younger Ketan!

Almost simultaneously with this realization, word comes over the radio communicators that the Statists have reopened the Gateway, and struck through it at Kronweld with atomic blasts.

XXVI.

Elta stood dazed, as if powerless to control the motion of her hand. Transfixed at her own destruction, she watched the slow crumbling and melting away of the mighty terraces before her.

The beam cut through the metal wall of the Selector in a long white gash that slowly turned to yellow and remained blood-red until the beam swept back again.

Twice, the beam traversed the long front of the barrier behind which the intricate mechanism lay. Then slowly and ponderously the upper portion began to totter and vibrate with a shuddering motion that increased in its terrible amplitude as one after another of the supporting beams was burned away.

She saw the altar on which Ketan crouched amid the blazing aura of the opened Gateway. He would not be harmed. The Gate had opened before she pressed the trigger of the gun.

Her lips formed a wordless murmur of farewell as she saw him disappear amid the final blazing coruscations of the halo.

Then it was dark and the altar tipped and plunged into the boiling inferno of crimson, flowing metal. With the terraces gone, the intricate mechanism of the Selector itself was exposed to the beam. Blue flames of electric discharge arced between the close-meshed wiring until whole areas became sheets of rippling fire.

Hundreds of tubes of glass and metal collapsed under the point of the destroying beam. Some exploded in a rumble of thunder that further shattered the circuits as their gases were released and turned into isotopes.

Behind Elta, the massed unfortunates who waited with their infants were too bewildered to comprehend fully. But when they saw the altar and its encircling halo collapse and fall into the flames, a thunderous roar came from their throats that drowned out the crackling of the electronic fire and the exploding of circuit components of the Selector.

All the pent-up hatred and misery of generations who had been forced under the tyranny of the Selector to risk their children's existence was released at once. It became a torrent of inchoate verbal expression that shook the walls of the building and flowed outward in a wild cry of triumph over the vanquished enemy.

But Elta did not hear it.

Through the almost blinding moistness in her eyes she watched for the approach of the Statists who were fighting their way through the animal mob to reach her.

Methodically piercing the blazing ruin, she tried to pick out the spots that seemed critical and vulnerable. A half dozen times, she saw the figures of men rushing blindly into the spray of her beam and vanish like smoke puffs. She saw through to the great operating chambers where attendants placed the electrode caps over the heads of the infants and recorded the potentialities of their brains and characters.

A hundred infants must have perished with the Selector.

They were upon her then, a score of armed Statists who seized her arms in a crippling grip and tore the weapon from her hands.

For a moment she thought they were going to kill her there, so great was the rage and frustration upon their faces. She would not have cared at that moment. She had accomplished all she had ever hoped to accomplish in life—apart from the one dream that she had always known could never be anything but fantasy.

The Statists bore her forward through the mob towards a side door. If the hall had been less densely filled, they might never have taken her, but those only a few steps away from her did not know what was happening. They knew only the tremendous, unbounded elation over the fact that the Selector was no more. And they knew that it could never be restored, for even the Statists themselves could never rebuild it.

As it was, only a few angry insults were hurled at the Statist guards and those bold enough to give vent to their feelings paid for it with their lives as the guards shot mercilessly into the ranks.

They hurried Elta out the side of the building and re-entered at a nearby portal. She had no conception of where they were taking her, nor did she care. She watched listlessly as the walls of endlessly winding corridors passed her vision. Then they stopped before a wide door.

The Statists consulted a moment and the door opened. Elta looked in upon the huge chamber full of electronic equipment and her interest rose in spite of herself.

She didn't notice, until the voice spoke, the man-sized tube located centrally opposite the door.

"Leave us alone," the low, powerful voice said.

Elta chilled involuntarily at the sound of it. She knew now where she was—the fabulous sanctum of the Director, and that thing in the tube must be the Director, himself.

The Statist guards left at once and the door closed. Elta could not see clearly into the tube, but what she did envision sent a wave of revulsion through her.

She had heard tales all her life of the crippled and ageless Director, of the tube that held the half man, half machine and fed and kept him alive when he should have been dead long ago.

There was pity and disparagement and revulsion for his helpless state. She fought down an almost overwhelming impulse to turn and flee.

That would have been vain, she knew. She had destroyed the main instrument of the Director's power, and she was here to be dealt with. She knew that a quick death would be too much to hope for. She only hoped that her father, Javins, would not have to suffer for what she had done.

She thrust her head up and let the cowl of the cloak fall to her shoulders and pile behind her neck. She strode forward.

"That's better, my dear," the satisfied voice came again.

Those sightless eyes were looking upon her, and though she heard the voice, those withered lips never moved.

"I am here," she said. "Do what you are going to do quickly."

"Very quickly," he said. There was a sudden urgency in the voice. "Come closer and listen carefully to what I have to say. Your father, Javins, is outside. He has with him the gauge of the Selector. I wonder if you know what that means."

She shook her head in stunned bewilderment. Her father here! What did that mean?

"The gauge is the mechanism that controls the positioning of the Selector. It is adjusted to the relationship between the planes of Earth and of Kronweld. We can build another Selector, but if the gauge and its setting had been destroyed we could never again get through to Kronweld.

"Even as you were destroying the Selector, I ordered your father to remove the gauge to safety."

"But no one knows the principles of the Selector! It can never be restored."

"But it can," the Director said softly. "It can so long as the gauge is safe."

The infinite calm of accomplishment vanished from Elta's mind. If what the Director said were true, the whole terrible problem was exactly as before. She had accomplished nothing by her risks. But what was her father doing in this? All his life he had expressed a secret, sullen dislike of the Director and the policies of the Statists. That's why she had originally planned to come back to him, to get his assistance, but it hadn't been necessary to ask it. He had never gone as far as Elta, but surely with the destruction of the Selector assured, he would not move to salvage it.

The Director read her mind. "Your father and I have worked hand in hand in many things that would surprise you," he said. "We have followed your activities with pleasure. It was unwise for you to attempt to kill your sister, however. Unwise, and unnecessary."

He was playing with her, Elta thought. Enjoying this cat-and-mouse play before he killed her by some slow and torturous method. Both her and her father. Somehow the Director had heard of Javins' talk and was avenging himself now.

"I was not quite correct in saying that we can duplicate the Selector," the Director said. "We do know, however, where the information concerning its construction can be obtained. Your assignment is to go with your father and obtain that information for me, and open a Gateway again into Kronweld."

It was senseless and without meaning to her. If he were merely playing, he was leaving himself no place for a delicious climax. It was all so fantastic that she knew it was lies before he attempted a denouement.

But he was not stopping. "Would you not like to see Ketan again?" he said.

A sob escaped her lips. "Please kill me and be quick."

"You will go into the forest beyond the airfield. Javins knows the place. Still there is the ship in which Ketan came to the city this morning. William Douglas is waiting for him. You will tell him what has occurred, and ask him to take you to the pinnacle. There you will find sufficient information to enable you to reopen the Gateway."

"The pinnacle! You know where it is?"

"I was there many times—quite a long time ago. Come here. Step close to the tube. I'll lower the field." His voice seemed to take on a strange note of pleading.

Elta felt the force field that had pressed her away from the tube relax, and she almost fell forward, not realizing she had been leaning against it for support.

She caught herself and was almost near enough to touch the tube. The obscene horror within it was quivering with spasmodic motion as if an electric current were flowing through a corpse.

Through the mist of horror she saw that fully half the body was gone, destroyed in that long ago accident that had nearly taken the

Director's life. The figure seemed to be struggling within the tube to raise its arm, but dead muscles refused to come into play.

The Director tried again, and then with ghastly contortions, the twisted arm raised like a dead tree branch torn about by the wind. Trailing filaments of wire hung like a spider's web.

"Look."

Even the artificial voice seemed to reflect the intense pain of that effort at motion.

As if hypnotized and unable to disobey, Elta stared down at the remnants of that arm. "I don't see—" she murmured.

Peering closer then she saw it, that telltale purple mark of the Director's brand that had been stamped a century ago when he went through the Selector.

"What should I see?" There was nothing significant about the repulsive sight.

"Can you read it?" The Director gasped for breath under the exertion. "Quick!"

Then the arm collapsed and fell at his side. He was no longer able to maintain the position. But it had been long enough. Elta had seen what he had meant her to see.

She gasped and her universe tumbled and collapsed about her. "You—a reject!"

"I was the first to come back. Does that mean anything to you?"

For a moment she stared in fascinated silence. Then she breathed a single word.

"Igon."

"Yes."

"There are a thousand questions in your mind now," the Director said. "But there is no time for them to be answered. Trust me. You will some day learn all the answers. Remember that I am letting you go when I should order your execution if I were nothing but the Director of the Statists. I sent Ketan back to Kronweld to keep Bocknor from killing him. Remember those two things and do as I have asked. Now, go quickly. Javins is waiting for you outside that door. He knows the way to William Douglas."

A door opened in the wall at Elta's left hand as if at the Director's control. Mechanically, Elta turned and walked out, as if her body were under some control not her own.

A moment after she had gone a figure entered the main doorway. The Director scanned him with his electronic eyes. "You heard, Bocknor?"

The fat, sharp-eyed Statist nodded. "Very clever, I think. But are you sure they know the way to the pinnacle?"

"Of course. William Douglas and Ketan have been there. William Douglas will take them there. It's up to you from now on. Follow them carefully and see that you don't lose them. I can't be sure that Elta will ever contact me again. All I can know for certain is that they are headed for the pinnacle. Follow them! Don't muff this or I think you know what the results will be."

In the corridor, Javins was waiting for Elta. When he saw her he gathered her wordlessly into his arms.

"Father!"

After a moment he held her off and looked at her, then released her abruptly. "I'll have to tell you later how good it is to see you. We haven't any time to lose," he said. He bent down and picked up a small, heavy leather case at his feet.

"Tell me what it's all about," Elta pleaded. "Is the Director actually Igon from Kronweld?"

Javins dropped the case and clapped a hand over her mouth. "You little fool," he said harshly. "That could mean his life if anyone heard you." His eyes darted about the corridor and the long thin lines of his face deepened with worry and fear. He relaxed his fierce grip upon her.

"I'm sorry," she said.

He bent down and retrieved the case. "Forgive me. But you don't understand the magnitude of our task. Or the dangers of it. The success of his lifelong plans depends on our next few days' work."

Subduing the question in her mind, Elta drew the cloak about her and raised the cowl over her head. She followed silently behind her father. The stoop of his tall figure, and the fear and anxiety she had seen in his eyes touched off a pang of pity within her.

All his life he had been a mild-mannered, disgruntled servant of the Director. Now to find him involved in some incomprehensible intrigue was almost as startling as the revelations made by the Director. Director Igon.

He hurried her out to a waiting car and they sped through the city towards the airfield. Not quite there, they turned off the road into a twisting, blind alley that wound past rows of dirty, partly ruined and abandoned dwellings. It ended at the edge of the encroaching forest.

"We'll have to go the rest of the way on foot," said Javins. "It's a long walk, but the road is a ruin."

They started through the forest, went around the airfield at a distance that would not betray their presence to any onlookers on the field. Eventually they came out upon the broken concrete highway.

Javins broke the silence. "I understand you know this William Douglas. Tell me what he is like. Will he cause us trouble?"

"I only saw him once. He is a doctor who lived in Danfer under a false brand for many years. He is much more intelligent than I had always thought the Illegitimates to be, however, I don't know whether you can make him believe your story or not."

"He is one of us, a member of a part of our group designated by limited knowledge, though I have never met him. He was sent back to accomplish certain work in organizing the Illegitimates. An unforeseen accident was responsible for the death of his wife and child. He may have been embittered and have turned against us because of that."

"He is loyal to Ketan and believes sincerely in what he was trying to do, if that means anything to you. Please explain what this is about. I don't understand any of it."

Javins turned and viewed her with a smile. "I'm afraid you will not be so pleased when you know. You almost succeeded in destroying all our plans. Fortunately, your acts could be turned to our advantage. That's the only reason you were allowed to go on."

"But what are your plans? Why do you wish the Gateway reopened? Surely not to—"

"Kronweld must be returned to Earth."

"How can anyone who understands a single factor of the problem believe that such union can take place? Even Igon—"

"I was told not to argue with you about it. As if I didn't know my own daughter well enough to not need any such instruction."

"I still will not help you, then," she replied solemnly. "I will fight it. Kronweld is the greatest civilization that has ever existed, but bringing it here would destroy it. The Statists, not Kronweld, would survive. No more than a generation would be required to wipe them out."

"Don't you think that Igon has considered all that, and planned for it? You don't realize the strength of the man. His is the greatest brain that has ever been born upon the Earth. A hundred years from now, his name will be deified. But here I am, arguing with you. We will not discuss it further until we reach the pinnacle. Igon wants you to see it and believe."

"I will never believe. I am still fighting you. I want you to know that."

Darkness set in with three fourths of their journey ahead of them, but Javins had counted on that. He did not want to frighten William Douglas away. There was no way of communicating with him.

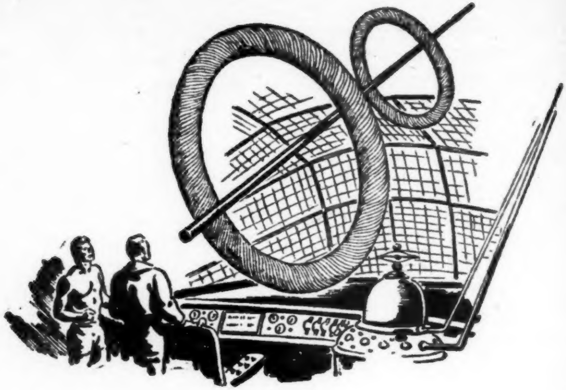
They went on more slowly, picking their way with the occasional use of a powerful finger lamp that Javins carried. Elta was swiftly becoming exhausted by the day's events and the long journey. The slowly healing burns upon her legs were painful.

At last Javins came to a halt and peered intensely at the landmarking trees and boulders. "This is it," he said, "if Igon was correct. The ship and William Douglas would be about a mile to the left over that ridge."

Elta didn't see how it would be possible for them to find a small ship in the blackness of the forest night, but she was too weary in body and mind to demur.

Her father seemed able to pick his way unerringly through the dark shadows about them. A dozen times she stumbled over hidden obstacles and he lifted her up, until he took her arm with his free hand and guided her through darkness.

The Director had told him something of what to expect, but he had imagined nothing as shining and beautiful as the slim-pointed cylinder that spoke of ancient workman-



ship as it glinted in the starlight. He knew it was a far superior vessel to any built by the Statists.

Javins shook off the fascination of it and peered anxiously about. There was no sign of the Illegitimate. Javins wondered if he were in the ship. The hatch in the base was open.

"You go in and search for him," Javins told Elta. "He knows you and will not be frightened by your coming. But I remember what you said. Don't try to persuade him to escape with you."

He drew out a tiny hand gun. "I will follow you shortly and be in the ship before it could take off."

Elta glanced at the gun and shrugged and marched across the small clearing. In the recesses of her mind she wondered if the gun were meant as a threat to her or to William Douglas.

She reached the hatch in the base of the ship and called his name. At that moment there came a sharp cry from behind, across the clearing. She turned in time to see the figure of her father hurled to the ground. She raced back and faced William Douglas across the fallen form.

"Elta!"

"Quick!" She pointed to the fallen leather case her father had carried. "Turn your gun upon that and destroy it!"

But William Douglas' last impression of Elta had been as an opponent, crafty and advantage taking.

"Where's Ketan?" William Douglas asked. "He went into the city this morning. Have you seen him? And who is this man?" The gun of the Illegitimate came up in a threatening gesture.

"I'll tell you everything, only please destroy the box first. You must!"

"You are an intelligent man, William Douglas. It would be best to investigate, first."

They both whirled at the sound of Javins' voice. He was raised up on one elbow, shaking his head and feeling the lump on the back of it.

"Who are you?" William Douglas demanded.

"Father of the zealous young lady, and executive assistant to Igon. The key is Richard Simons."

Slowly, incredulously, William Douglas lowered his weapon. "What do you want of me? It's been months since I heard that key. Come into the ship and tell me."

A bit unsteady on his feet, Javins picked up the case and took Elta's arm as they followed the Illegitimate to the ship.

"Don't look so downcast," he said softly.

Elta made no answer.

In the ship they sat at an unused chartman's table in the navigator's cabin.

"All your questions can be answered very quickly," said Javins. "Ketan was captured by the Director and returned to Kronweld as a punishment, to be destroyed there when the Statists exterminate the entire realm. Immediately afterwards, Elta destroyed the Selector, a deed which was anticipated by Igon, and he ordered me to remove the heart of the machine so that the Gateway could be rebuilt at another time. We have been instructed to take this gauge, as the device is called, to the pinnacle and reconstruct the Gateway. We shall contact Ketan as soon as this is done and make arrangements for his people to come through.

"Incidentally, my daughter is still unconvinced of the wisdom of this, as you saw by her desire to destroy the gauge. Igon, however, believes she can be convinced by a visit to the pinnacle and be made useful to us."

"What do you want me to do?"

"Take us to the pinnacle as quickly as possible."

Elta remained in the navigator's room as the ship rose in the night. She did not move from her position in the little cell which gradually oriented itself along the horizontal as the ship rose and pointed its nose southward.

As she stared out the port in silent introspection, she tried to reconcile herself to one or the other of the extreme positions of Ketan and Igon, or of the Statists.

Certainly the plan of the Statists was one of insane murder and destruction.

But was that of Ketan's and Igon's group any less so, even if indirectly?

It was strange that she had found no one in accord with the middle course plan that seemed so sane to her—eternal separation of the worlds.

True, such a plan meant extinction of Kronweld through the sterility of its people, but surely that was far better than the consequences of either of the extreme plans.

She thought of Igon with his hundred years of knowledge and experience in both Earth and Kronweld. She would be willing to bow to that experience and attempt to understand his goal.

If she could be sure that Igon still lived!

As she pondered, the more unlikely it seemed that the remnant of a man in the citadel of the Statists was anything but the Director.

As such, he had been the one to conceive the plan of destroying Kronweld. Igon would have originated no such scheme for any purpose whatever. Under the Director's leadership, hunter Statists had slaughtered Illegitimates by the thousands. Even now, a deliberate and scientific program of extermination was going on throughout the world to wipe out the isolated bands of those who had escaped the Selectors throughout the decades.

That brand he had shown her. It could be part of his subtle scheme to get her aid in reopening the Gateway so that Kronweld could be destroyed.

But final judgment would wait, she decided. She would see the pinnacle and learn more of her father's dealings with the Director. She would be certain of success when next she acted.

In the meantime, the thought of the reopening of the Gate made her heart beat faster. The temptation to go through it, to see Ketan again was almost overpowering. What if it were opened, and she went through—and left behind a means of destruction which would destroy the gauge, the pinnacle, and all possible evidence that would lead to another path from Earth to Kronweld?

She sat staring out into the silver night, her mind possessed by furious action at the thought of such a possibility.

The pinnacle rose above the swirling sand clouds like a mountain peak above a sea of fog. William Douglas pointed forward. "There it is."

Beside him, Javins strained eagerly, his eyes trying to pierce the darkness. "No wonder it was never found," he murmured. "But what a sight! I've lived for this. A thousand times Igon has told me how he first came here, afoot after traveling for days without food over the desert. He was nearly dead when he reached here. He stayed more than a month recuperating. When he left, he took one of the vehicles stored here, a small land car. He showed it to me once."

"Igon must be *old,*" said William Douglas. "He can't live much longer. What will happen when he is gone?"

"He expects to live only a few more weeks or months at the most, but he has prepared for his death. The plan for the restoration of Earth will go on."

The ship circled slowly and caught the first rays of dawn as it swung back towards the pinnacle, towards that dark, needlelike spire. William Douglas was hesitant about his ability to drop the ship through the narrow opening in the top of the spire. Even as he circled, he saw it open below them as if their arrival had been awaited.

He shot over the opening and turned the nose of the ship skyward. And then he knew he wasn't going to have to worry about setting it down into the hole. A force gripped the ship like some great hand and removed it entirely from his control. Slowly, it settled until the walls of the pinnacle rose up on all sides like black curtains.

Javins was silent with amazement as he saw the manifestation of the automatic machinery within the pinnacle. "Igon told me of this but I could never picture it as real."

"Wait until you see the rest of it," said William Douglas. "You'll know you're dreaming."

As they emerged from the port, Richard Simons and his daughter were waiting.

"You are back soon," the scientist said as he advanced with a smile and outstretched hand. Then his face sobered. "But there are strangers. And Ketan is not here. What of this, William Douglas?"

"These are from Igon," said William Douglas. "Ketan went back to Kronweld. We have come for information on the construction of the Selector. It has been destroyed, all but the gauge."

"What is the key?" the scientist turned to Javins.

"Richard Simons."

His smile broke again. "Very well. We must be careful in risking the pinnacle, you know. Unauthorized entrants would be instantly destroyed."

"It is late. You must be tired," said Dorien. "Would you like to rest until morning and we will give you the information you desire?"

Elta was staring at the girl with the same shocked recognition that Ketan had shown. It was like the golden image before the Temple of Birth suddenly come to life.

"We would like very much to rest," said Elta.

"The information," said Javins, "is most important. We'd prefer that first. I'm sorry"—he turned to Elta—"I had forgotten what a day you have had. You rest. We will see the plans for the Selector."

Reluctantly, Elta was forced by her own weariness to agree. She disliked leaving her father alone with the precious information, but she knew she was incapable of enduring more without rest.

Dorien led her away.

The sunlight that had touched the plane when it was high above the pinnacle descended to the desert in a short time, but Elta did not awaken until the sun was high. The light came through the latticed openings of the curtain and woke her. She stretched in luxurious comfort upon the soft bed and breathed deeply of the cool, fragrant air of the room. She drew the curtains then and looked out upon a landscape that made her gasp.

A garden of flowers stretched to the hills as far as she could see. On open spaces of green grass lambs played and leaped in the sun. Beside the window a slowly moving shadow of a tree echoed the rhythm of the breeze.

"Do you like it?"

The soft, musical voice came from the doorway. Dorien stood there smiling and then advanced and sat on the edge of the bed.

"It's beautiful," exclaimed Elta, "but how—"

Dorien explained the pinnacle and its illusions and realities as Ketan had heard them. An unreasonable, haunting sadness brought tears to Elta's eyes with the thought that this lovely girl had lived and died more than a thousand years ago.

After Elta had dressed, they all had breakfast in the same dining room where Ketan and William Douglas had eaten. The images of the two ancient ones went through the motions of eating and entertained them with fascinating stories of their own age.

Javins was amazed and overjoyed at the experience of being privileged to view the wonders of the pinnacle. Regarding the Gateway he said to Elta, "It's simpler than we thought. With the abundance of equipment here we can build around the gauge in five or six days a unit large enough for our needs. All the other circuits that were built into the Selector had to do with the examination of the infants. The Gate itself is simple. It requires tremendous power, but that's already available here."

Elta made no answer. Since arising the sensation had been growing in her mind that she was in the grip of a strange, unreal power. A power that went beyond the bounds of all understanding and was slowly molding her thoughts and beliefs to its own pattern.

She couldn't resist it, it was so gradual and persuasive. But she wasn't sure she wanted to resist it. The thing she wanted to do was explore and delve into every secret of the vast pinnacle. This was the same power that had infolded Ketan and established his unyielding position. She wanted to know it, to experience those same forces that had molded him, and try to understand what had been in his mind.

She felt somehow that her own standards were slowly shattering. Yet her one pivotal question remained unanswered—and apparently unanswerable.

The Kronweldians were not fit to govern. There would be conflict and death and terror when the two civilizations met and—she could envision no other possibility—the Statists would exterminate the benevolent invaders.

She followed her father and William Douglas and the image of Richard Simons to the laboratory where they were rebuilding the mechanism that would once again open the Gateway. Javins looked at her questioningly, but she said nothing. The change was in her eyes and he saw it.

With Dorien she went through the pinnacle. She saw the great underground power chambers hundreds of feet below the surface of the desert where Ketan had not visited. She saw a score of fantastic landscapes of gardens and forests and mountains and lakes. These had been built by the ancient scientists for their own enjoyment in anticipation of having to live much of their lives in the pinnacle, but most of them had been busy to the last with their work of gathering the remnants of Earth's science.

That afternoon they came to the laboratory where the replicas of Earth's scientists worked over their ageless dreams. As Elta came out upon the little balcony that overlooked the room, she gave a little involuntary start of stage fright at what appeared for an instant to be a vast audience watching her.

Dorien touched her arm. "They are the same as we."

The impact of the sight before her penetrated more deeply into her consciousness than it had into Ketan's, for she caught the meaning of it instantly.

"Let's go down," she said breathlessly.

They walked among the busy images and Elta talked with them. Talked with Archimedes and Aristotle, Mendel and Descartes, Newton and Einstein. She listened and was lost in their dreams and visions.

She spoke with the scientists who had lived just prior to Richard Simons' own day. She saw the last days of their tragic history, when they groped for a solution to the night of blackness that was encroaching upon the world, when they tried to find a logical way to preserve ten thousand years of science against the invasion of the barbarian. And more than that, to preserve the intellects that would be born in that dark era.

She sensed the frantic urgency of those last decades before darkness closed down. She understood the dream of Utopia that they dreamed of in the strange land of Kronweld.

It was easy to vision Ketan here among them. She could picture him overpowered by this revelation of a mighty dream. But with him there had been ready and willing acceptance with no thought of criticism. He had been told what the plans for Kronweld were and Elta knew he had not stopped to criticize the plan because he had no knowledge upon which to base judgment. He could not answer the question of whether or not they were prepared to govern because he did not comprehend the problems involved.

There was no answer within the pinnacle, she knew.

It was two months instead of Javins' optimistic five or six days before he peered through the reopened Gateway into Kronweld. It was the first he had ever seen it. The vision of its marble palaces and the purple curtains in its sky was like some exotic dream.

He sat before the small instrument panel controlling the forces connecting the worlds. The vision was open to him as if through a doorway beside him. And, indeed, he could have stepped through that doorway into the world of Kronweld, for this was a simpler arrangement than the Gateway in the Selector. It did not require the instantaneous opening and closing to prevent as much as possible a vision from one world to the other as was necessary in the Temple of Birth.

He shifted the Gateway about,

careful not to bring it too close to any individual who might have been surprised to suddenly look into the space beside him and see a queerly dressed individual sitting at a table of strange instruments.

He wondered where Ketan was and how he could be located, but that was not his task. His part was done now. He moved to call the Director on his private circuit.

"That won't be necessary. I will take charge from now on. Your part is done."

Javins whirled at the sound of the familiar, hated voice.

"Bocknor!"

"Your colleague."

"How did you get in here?"

"Richard Simons," the Statist grinned mirthlessly.

Javins did not move. He knew resistance would be vain in the face of the weapon in Bocknor's hand.

Then Bocknor advanced. "Maybe it would be a good idea if you completed that call to the Director. He would like to know that we are ready."

In a daze, trying to fathom what this turn of events meant, Javins called the Director and in a moment his face appeared on the communicator. His voice came to them.

"I have been watching you," he said. "I see that you have completed your task, Javins. You have done well and I will remember you. Bocknor's task is just beginning. You may proceed. I shall watch with interest."

"Attack?"

"You may set the hour."

Bocknor cut the circuit and called half a dozen others. From the corner to which Bocknor had driven him, Javins watched the screen and wild horror overcame his senses.

He saw bank on bank of fearful atomic generating stations and the great tubular projectors they fed. There were six of them stationed within great forts within the city. They had been built without any knowledge of it coming to him. And anyone of the projectors could wipe out the pitiful city of Kronweld in a single instant.

Bocknor called his commanders one by one. "Attack time, three hours," he said. "Are you ready?"

One by one they acknowledged.

The click of the switching circuits was magnified a thousand times in the hollow chamber of the laboratory. The sound swelled and tumbled about Javins' ears. It grew to a crashing roar that was the thunder of the shattered segments of his world. All his life had been based on the one precept: The Director was Igon who would some day unite the worlds.

That precept was gone now.

XXVII.

For the time of a single breath Alva and Ketan remained motionless, staring at each other, while the soft white flakes rocked their slow pendulous way down from the sky.

"Attack!" breathed Alva. "What if that were Hameth we saw? But it couldn't have been. He's got to lead us. He's the only one who knows the full details of the defense and attack plans."

"It couldn't have been he," Ketan murmured. "We only imagined it. Let's get back. Our generators will be needed."

His mind seemed dulled by the sudden blankness that had appeared, the blankness of the revelation of Hameth's identity and his destruction.

He climbed through the hatch and up to the control turret of the generator. Automatically, his fingers found the controls and he turned the machine about and headed towards the valley, following behind the other two machines that were now almost invisible in the curtain of snow.

Against the white background he kept seeing the image of a crushed and shattered form, roughly human. A form of steel and glass and copper and plastic. He tried to tell himself that the whole incident was only the wildest imagination. He couldn't possibly have seen the near naked form racing afoot through the snow. That alone was insane enough.

But Alva had seen it, too. And the other driver.

They hadn't seen it, he told himself, and closed his mind. Nor had he seen that spot of glistening wreckage in the ruts of the generator's wheels.

His communication panel was on a direct circuit to Operations Center. He could hear orders given in crisp, sure voices by the subordinates in temporary command. The attack and defense plans were well laid out. The men knew their places. Hameth himself could almost be spared except in emergency conditions. But emergencies would certainly arise. No one could take his place then.

As yet Ketan's name or the number of the generator he occupied had not been called. He knew it was unlikely it would be. He knew where his place was and he put on all possible speed to reach it. There were emergency orders, however, which had been created by Hameth to be opened in his absence during any such crisis. They might change everything.

At that moment the communicator spoke. "Ketan—driving generator three-twelve."

He gave a start. "Responding."

"Emergency orders require your presence in Operations Center at once. In the absence of Leader Hameth you are delegated in temporary command to execute defense plan G-12. Respond."

"Responding," Ketan answered mechanically. "Use the interplane transfer."

Two segments of his brain were swept with utterly contrasting thoughts. One dwelt on the incredibility of his position. Designated in temporary command. There must be a hundred men more suited for the post, he thought. Yet—

He thought of the long hours and days that he had spent with Hameth, the merciless drilling until he knew the combat plans with the familiarity of old habits. He wondered if there were actually any other men who had been given such careful and now obvious drilling. Had Hameth anticipated his destruction before the attack?

The other segment of Ketan's brain was swiftly going over the memory-photographed plans in Operations Center. He called swiftly back into the microphone.

"Give me the attack pictures."

While preparations were going forward to bring him bodily back to the Center by means of the Gateway, the subordinate answered, "There is only one break-through. A single beam burst through the Temple of Birth. No damage has occurred in the city as yet."

"Order the Ladies out of the Temple—the survivors."

"That has been done."

"Array a mesh before it."

"Done."

"Excellent. How many projectors are the Statists using?"

"Reports indicate six forts, mounting an unknown number of projectors. It is believed there is only one to a fort, however."

Ketan frowned. He couldn't understand why Hameth hadn't been able to get more accurate information with his elaborate intelligence service. It seemed unlikely the Statists would have so few projectors, unless they were of terrific magnitude. But then they did not anticipate any opposition from Kronweld. Probably the six forts seemed an insanely huge force for the job of wiping out the helpless city.

At that instant a tearing, blinding sensation blotted out all consciousness for a moment, then he found his machine beside the great spiring Operations Center.

A driver was waiting to take over the generator, and Ketan hurried into the building, the great planning chamber that was the brain of the defense of a world. It was filled only with a soft hush of sound and occasional sharp commands that in no way indicated the momentous events occurring.

In the center of the room a huge map showed Kronweld, Fire Land, Dark Land and the valley of the Restorationists. On the spot where a small model of the Temple of Birth lay, there was a tiny flame of fire slowly moving about, washing vainly against a tiny mesh cap that covered it. Tiny green lights indicated the position of nearly four hundred of the mobile generators plus the one mighty stationary weapon.

Around the walls of the room communicator panels showed facets of the attack. Motionless operators sat before a score of positions waiting for the order to move generators through the Gateway into Kronweld or place protective meshes over break-through points.

Ketan strode at once to the map. There was no more questioning in his mind concerning his position. There would be time enough for that later. His appearance before his subordinates was of one who had been in command all his life.

He scanned the map minutely. "No additional break-through points?"

The second in command shook his head. He was an elderly second-generation Restorationist whom Ketan knew would never question

Hameth's decision as to the succession of leadership. The man had only one, almost fanatical ideal, the success of the restoration.

He was Zeeter. He said, "There are no others. We have aligned no units as yet. I wanted to test our mesh against the projector. It is holding up well."

"Good. But a second attack is sure to come. We'll hold the big generator until we take the offensive, if possible. Align eight units of generators in checkered pattern across the city."

Even as he spoke, the tiny fire on the map died down and reappeared almost instantly outside the mesh. This time there was a long beam that swept and stabbed into the city. Where it touched, buildings and trees vanished in flames.

"Screen it!" Ketan shouted the command. The operator handling the mesh shifted it quickly to the new location.

In that instant the Statist projector vanished and reappeared again in another section of the city. The shielding mesh dropped about it but not before damage had been done.

"Position those units!" Ketan ordered. He whirled about to the operators controlling the positioning of the mobile units. He did not underestimate the complexity of their problem, but his training in the operation of the *Karildex* made them appear inexcusably slow in handling the few dozen factors required of them.

The sweating lead operator turned and nodded. "Units positioned."

Ketan looked back at the map. Crisscrossing the city in a checkered pattern, two hundred and forty of the mobile generators lay in wait for the next appearance of the projector. Any position in which it appeared now would place it inside a square of generators that would spray it with merciless fire.

It appeared in a moment beside the building of the *Karildex.*

Ketan gave a hoarse exclamation. The *Karildex* was the one structure he had hoped to save from damage, but now it was bathed in fire.

A mesh screen dropped over the projector and blazed white, hiding the machine from view, but in the moment it had been visible Ketan had caught just a glimpse of a featureless cylinder surmounted by a dome. Spears of violet light beamed out of focusing rings surrounding that dome.

The screen placed about the projector by means of the interplane method of transport offered partially mono-directive opposition to the radiant destruction, blocking that from the trapped projector and passing most of that trained upon it by the square of generators.

He had watched this out of the corner of his eye as it appeared on a nearby communication panel. He moved closer and dimmed the reception until he could plainly see the tessellations of the mesh and the interplay of atomic fire at the centers of the squares where the attacking beams touched from the inside.

Ketan knew that the stream of violet energy was playing against the inside of the mesh by the appearance of spots of blinding incandescence that played over the surface and came at last to a halt in a blaze that threatened to burst the mesh shield.

Ketan called to the operator handling the mesh. "Check your screen current. It's glowing into the white in several spots."

"The Eighth Unit Commander asked for a reduction. He can't get through with his beams."

"All right," Ketan assented. "Ready a second screen when this one goes."

The success of this method of defense and attack depended on the obtaining of the critical value of current that would block the projector beams but allow sufficient energy from the attacking generators to pass through and blast the projector.

To Ketan it looked as if that critical value could not be obtained. A dozen spots on the screen were glowing white. A rain of incandescent copper droplets was streaming away from the spots. It would only be a moment before the screen went.

The twelve generators forming the square about the Statist projector held their beams in a circle of flame that would sever the head of the projector if they could get through the screen without themselves being destroyed. Torrents of energy were pouring through the screen, but it was not enough.

Ketan turned his viewing screen upon the drivers of the generators. Alva was there. His lips were pressed bloodless as he watched the screen flaming and dissolving under the double impact of energy. Few moments remained before it would become a puff of volatilized copper.

With a sudden, decisive motion he shifted his own beam and trained it directly upon one of the screen's disintegrating spots, which he knew must be in line with the Statist projector.

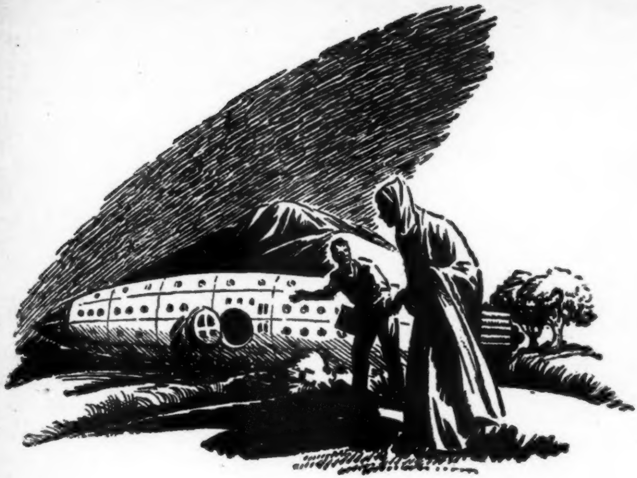
Instantaneously, the screen vanished at that point and both beams drove through. White coruscations blasted from the hole and streamed out over the landscape, mingling with the half visible auroral curtains in the sky. For an instant, the light dimmed the twin globes in the sky.

When the normal light of day had come again, the projector was gone as was the mesh and one of the generators—Alva's. The two machines had destroyed each other simultaneously.

It was a victory, but to Ketan it was at terrible cost in the sacrifice of a man he knew and liked.

He turned away. It was time to carry the battle to the Statists. He spoke to the position operators again. "Throw Unit 9 into Danfer." He knew that other projectors would come to Kronweld but he hoped to beat them to the attack and create sufficient confusion in Danfer to hamper their operation.

The thought of the thirty generators playing their beams at random in Danfer made him more than a little sick with nausea. He wondered if it had the same effect on these others. Not ten percent of



the entire colony of Restorationists were first-generation Kronweldians. There was not a single one in the Operations Center besides himself. He could not betray his weakness to them. They moved so precisely and cold-bloodedly to carry out the assignments that he doubted if they considered that men and women were being killed, blasted into living flares by the battle waging about them.

Unit 9 was moving into position now. They waited with power plants at peak potential. And then the fantastic illusion of a great doorway seemed to open beside them. It was as if a chasm swallowed them. They vanished and were in Danfer.

The setting had been off a trifle because the operators had not risked a preliminary check by opening the Gateway. The generators were within a half mile of the Statist citadel when they came through. Ketan watched them. In perfect formation they oriented themselves and drove in ponderous might towards their goal. The wheels crushed the concrete of the roads and ground it to powder with the weight of the monsters. Where they crossed sections of dirt path, they sank the depth of their thick, tapering rims.

But Ketan's eyes were upon the bystanders, the commoners of Danfer. They stood beside the road, staring at the nightmare machines that had suddenly appeared.

Some of them screamed and ran. Some stood in horror that froze all movement. Many of them would be killed by the generators.

Ketan expected that the Statists would move one or two of their projectors to the vicinity of the citadel to prevent its destruction. But not a single one of the weapons appeared.

An ominous, unrecognizable presentiment invaded Ketan.

The thirty generators ground the pavement to dust in a wide and ragged line about the structure. They held their protective screens in readiness, but no attacking beams sought them out. At a signal from the Unit commander they let go simultaneously with the full force of the belly full of atomic power plant that each of them held.

The sight was one that Ketan had tried in vain to imagine, an entire Unit with all its beams blasting at once. It seemed as if he were looking suddenly into the face of Earth's sun. The atomic forces exhibited by that mighty ring of generators were a fair match for the sun's.

He cut down the reception a thousandfold until the turrets of the generators were visible. The Director was gone now, Ketan thought. It seemed strange that it had been so easy, but the Statists had been too sure of their invincibility. Defense had never entered their plans.

Overtones of regret went through Ketan's mind. He would have liked to have seen the Director once more, to have learned something about the creature's mind.

He scaled the reception down still further to see, if possible, the ruin that was once the Statist citadel, but the screen was almost a solid rectangle of white flame.

He was about to turn away when the light dimmed as if the Unit commander had ordered a reduction of power to view the ruins himself.

Ketan looked back and it was as if he were looking through a sparkling crystal globe, gigantic, dwarfing the generators. Down the sides of that globe there washed and splashed the torrent of mortal fire from the generators still operating. Inside the sphere the Statist citadel was unharmed.

All Ketan's precepts seemed to shatter that incomprehensible vision. It was theoretically impossible that a screen could be built to withstand the force of a full Unit. But no screen was evident at all. There was nothing. Nothing but that spherical boundary beyond which the lethal radiation would not go.

He turned the view to the line of generators pouring out their mordant energies. He looked beyond—to the rows of blackened corpses that lay wilted by the reflected rays.

"Unit 10 to reinforce Unit 9," he ordered in a voice that carried across the room.

Despite their discipline, every man looked up a bare fraction of an instant. The significance of that order sent a wave of insidious, fearful doubt through them. No mesh had been built by them that was capable of standing up to the full force of a generator Unit. If the Statists had such a screen—

Unit 10 appeared in the streets, its thirty gray monsters rumbling forward to interspace themselves between those of Unit 9. As one their unendurable beams joined the others in a blaze of incandescence that forced Ketan to turn the screen away.

Over the city, half-crazed inhabitants sought refuge in the deepest cellars and behind the thickest walls. They cursed and were glad and died in the same instant, for they knew that a power had come to challenge the tyranny of their oppressors. Whether it were benevolent or a more enslaving rule they did not know or care. If it were anything less than the Statists, it would be more endurable; if more, it would only kill them more quickly.

That mighty radiation of the generators filtered through the earth and found them in their warrens. It passed through the walls and behind the wreckage of centuries that hid them. They felt it coming like a warm glow of sunshine that soothed them and warmed their burdened bodies and put them to sleep by mercifully burning out their nerve cells before it baked their bodies to lumps of carbon.

Ketan saw them cringing and dying in the depths of the city and called a halt.

"We can't touch that screen," he called to Zeeter. "Didn't anyone have any information at all on this?"

The man shook his head and swept back his graying locks. "There was no hint of it. We thought we had developed the most powerful screens that theory indicated were feasible. What do you plan now? Hameth's outline prepared for no such possibility—if only he were here now! That he should have left at this time!"

A warning flash appeared upon the map beside them. Then another blazed forth. "Two breakthrough!" Ketan exclaimed. "Abandon the attack in Danfer temporarily. Watch these two projectors. I'm going to send Units 9 and 10 to the bases of these two projectors. If they are forced to return, we may be able to destroy them there."

From the previous attack, the Restorationists had gained experience in handling the sudden appearance of the projectors. But the Statists were using new tactics now. They sent the two projectors into adjacent squares formed by the generators. That meant reducing the power in each square by one eighth unless spare generators were hurried into the weak spot.

Ketan gave the order and the spot was remedied. But a swift and perilous doubting of their own invincibility swept over Ketan. Surely the mighty Igon had prepared better than this if his plans had been maturing for almost a century.

The forces were so evenly matched that it seemed that victory for either would inevitably mean the ruin of Kronweld. Ketan tried to watch the two locales of action at once on different plates. He swung another to the streets of Kronweld. The scene there was one of panic and blind hysteria. In front of the hall of the *Karildex* there milled an angry, crying mob. The outside of the building was fused into globs of metal that hung like clusters of some fantastic fruit. The roof was open to the sky and the top of the great machine projected through.

With utter illogic, streams of Seekers were pouring into the ruined building, climbing over fallen wreckage and grotesque mounds of stone and metal that had dripped from the walls and hardened. They went in and stood before the ruined keyboards, pecking frantically for some explanation for the catastrophe. But the boards were dead, their power gone.

He swung the view to the Temple of Birth. There, more hundreds were gathered before the ruined shrine. They cried aloud to the God asking explanations and mercy. Frantic in the unanswering silence, some flung themselves across the still-powered purple line guarding the Temple's approaches.

Across the sky, smoke clouds that were not from Fire Land covered the twin globes and hid the dim sky streamers.

It was a picture of a dying city. With a fierce and mighty conviction that Igon had been wrong, Ketan cursed his name and a ruthless joy swept through him as he thought of that enfeebled brain perishing beneath the wheels of the generator. It should have died long ago.

This was no way to bring the worlds together. All the Seeking of the Restorationists and the science of Earth could have found a better way. Elta had been right in this part of her views, he acknowledged

But now that it was begun it would only be brought to an end by greater and greater blows of death. There was no stopping, no turning back. Perhaps this would be the final end of the vast struggle that had merely paused in Richard Simons' day.

Ketan turned to the attack upon the two projectors that were in the city. They were locked in stalemate with the generators surrounding them, and they kept moving from square to square so that it was impossible to bring up sufficient power to destroy them.

Power—applied in the right place—that was what they needed. The blast of a single generator upon the unprotected surface of the projector should be able to pierce the bare metal.

He left the viewing panels and approached the lead positioning operator.

"You were pretty far off when you set them down in Danfer. How close would you guarantee to come at considerably shorter range?"

The man answered without moving his eyes from his instruments. "The discrepancy in Danfer was due to the fact that we did not open up for a look before we shoved the generators through. If we can see where we're going, we need allow for no error whatever."

"Could you, for example, set a single machine down inside the mesh around one of those projectors out there?"

"Inside—!" The operator looked up incredulously for an instant and then his eyes swept back to his controls. "Of course, anything you require—"

Ketan backed away under the wondering gaze of Zeeter and the others who crowded about the scale map impotent to break the stalemate. He spoke into the general communicator and addressed the drivers of the generators not yet in use.

"Two volunteers for suicide missions!" he called.

An instant response from not only all of the waiting drivers, but those already positioned in the city jammed his communicator for a moment.

"Thanks," he murmured. The thunderous response he had not expected even though he knew the fierce ambition of the Restorationists. He tried to imagine a cause for which that many Kronweldians would have offered their lives and could think of none.

For an instant he wondered if his wild scheme were worth two Restorationist lives. It had to be, he decided; if it weren't those two it might be two thousand others.

"Why don't you lift the screens and let them fight it out?" Zeeter suggested. "We aren't making any progress."

"Half the city would be wiped out before the battle was decided."

"If our generators could get in a vital blow, it would be quick."

"We'll try this first. We won't have to lift the screens if it will work." He stepped to the huge files that gave the data on every man available for combat. He looked among the generator drivers for two men with sufficiently high response and reflex indexes to do the job. He found the two highest.

"Drivers 381 and 396," he ordered. "You will be taken to the maneuver area where you are to orient your machines due north and set your beams at full intensity. We will attempt to set you inside the mesh so that your beams will be aligned with the enemy projectors. There is small chance that this alignment will be correct. You must be ready to act instantaneously before the Statist realizes what has happened."

The two men understood the strategy. They understood that they must be successful or it would not be likely to succeed on a second attempt.

A position operator picked out their two machines and swung them into the barren plains far from the city. Every eye in Operations Center was upon them as their disrupting beams leaped out into the darkness ahead of them.

"Now!" Ketan commanded.

The operator touched his controls. The machines vanished from the plain.

From another vision screen a cascade of light poured into the room blinding all whose eyes were directly upon it.

The metal of one mesh instantly vanished as the projector within it was blasted by the beam of the generator that appeared beside it. The force of shattered atomic nuclei turned the attacking generator and the man within it to vapor that burned and leaped like a solar prominence towards the smoky heavens above.

The force of the blast rocked the twelve nearby generators and warped their facings. Three were turned completely over, the force of their shields the only thing that saved their drivers from being crushed.

But the second generator that appeared beside its projector created no such cataclysm. The two of them simply vanished.

Ketan leaped to another vision screen. He sensed what had happened. He focused upon the two Units he had sent to Danfer to surround the launching bases of the two projectors. At the instant the generator appeared beside the projector both machines had been carried back to Danfer—into the inferno at the focus of thirty generator beams.

In the path of the resulting holocaust was a deep crater in the earth where two generators lay warped and half-buried. Eighteen of the others were thrown on their sides, their great jagged wheels still clawing the air.

A projector materialized almost instantly in their midst and began sweeping the helpless machines with its mordant beams. Unable to move their turrets the overturned generators lay in the blanket of force fields created by their screens which turned aside the attacking beams for the length of time that it would have taken to determine an even combat, then they began to go down.

The terrific energy they were absorbing warmed and then began to melt the circuits within the generators and the shields went down. One by one, the generators vanished in pools of molten fire.

The ten machines that were still upright were warped and flung away from the crater, but they lumbered forward now to give battle.

One of them was completely buried in the debris of a building through which it had crashed, and out of the pile it sent a violet beam straight to the head of the projector. The screen of the machine was hastily flung up and flamed white in a scintillating mantle of light. It was a hurriedly created thing to defend the projector where no defense had been thought necessary, and it only partially turned aside the generator's beam.

Apparently disconcerted by the strange attack, the projector operator began sweeping the landscape with his beams. They swept into nearby buildings, sending them crashing into the street amid smoke and flame. The destroying fingers reached widly above the city and fired the hills beyond with a long arc of flame then came back and turned the mass of rubble from which the attack came into a smoldering, molten mass that slowly dribbled and sank, exposing the generator.

Without wavering his aim upon his target, the driver moved out of the ruin, watching the Statist screen flame and grow black under his fire.

The other machines were attacking from behind, now. Their beams, like the pent-up fury of all the lost generations, sprayed the projector with death. In a ring about the head of it, they swiftly beat down the screen. In the single instant it died the projector became a miniature, radioactive lake of molten metal.

In Operations Center Zeeter put a hand on Ketan's back and gave him a warm smile of admiration. "Hameth would have liked that," he said. "With twelve generators attacking through the screen, the one inside the mesh was enough to throw the balance in our favor. That accounts for one third of their force if our information is correct."

Ketan did not respond. He knew that the destruction of the two projectors meant exactly nothing. The destruction of all six of the Statist weapons would mean little more.

It was the Statists, not their weapons, that must be destroyed. A few masses of metal reduced to gaseous or atomic forms meant nothing. The only decisive factor in this conflict would be the utter annihilation of the brains responsible for it.

And those brains were locked safely in the impenetrable citadel of the Statists.

XXVIII.

"Will you want more volunteers for the next appearance of the projectors?" Zeeter asked.

Ketan leaned over the map and shook his head slowly. "We won't need them. The Statists will not give us a chance to repeat that performance, you may be sure."

He turned and walked behind the long row of position operators. Back and forth they swung their Gates, searching the terrain of Earth and Kronweld for the four remaining projections which the Statists held in reserve.

The men were nervous, Ketan thought. They had been schooled too long in the conceit of invincibility. They had thought their defeat of the Statists would be a matter of striding out and shouting "Beware the Restoration!" and every Statist in the sound of their voices would fall to the ground. Igon had not prepared them for retreat, much less for possible defeat. Perhaps, too, that was all part of the plan. Defeated, the Restorationists would have no reason for existence.

"Those four projectors have disappeared completely," the chief operator said.

"If that were true, we could stop worrying about them. Keep searching. I—"

He was cut off by a hoarse exclamation from Zeeter who was watching a plate showing Kronweld. "Look!"

The man was shaking violently as he pointed a finger at the plate. Ketan followed his stare.

At a point just above the ruins of the Temple of Birth, the Edge was no longer black. A spot of faint violet was glowing there, but it stood out like a blinding white glare so great was its contrast with the lightlessness of the surrounding area.

"What have they done?" Zeeter exclaimed.

It seemed reasonably obvious to Ketan. "They have aligned a Gate right at the Edge as was the case with the one serving the Temple. It is no doubt just big enough to admit the beam."

"But radiant energy cannot be transmitted alone through a Gate as can solid matter!"

"In that one region it apparently can. I have seen it in connection with the Chamber of Birth."

"We can't possibly locate the projector in that position! It could be *anywhere*—on Earth or Kronweld or on any of a thousand other planes."

"You're right. We can't." Ketan whirled and looked about him at the miniature reproduction of Kronweld. "We'll have to empty the city. Take charge of accommodating the Kronweldians here. Use the emergency police force and rescue squads for controlling them. As soon as they are here, prepare for attack. When the Statists find the city is being emptied they'll start looking for us, because they'll wonder why the defense still goes on. I give you full command at that time; I shall have other duties. Now, I want fifty men of the rescue squads at once!"

Zeeter moved to comply without question and Ketan turned back to the screen. He saw the single devastating beam sweeping slowly over the city. An attempt to screen it was made, but the beam moved constantly about and only momentary interruptions of its destruction were accomplished.

The beam swept the ruins of the Temple and turned the remnants of its walls into powder and lava. The molten rock gathered slowly in a pool that rose higher and higher, its white surface mirroring the smoke waves in the sky. It filled the depression where the building had rested and rose above the surface, forming a wall that hesitated a moment while surface tension held. Then it broke like some fearsome dam and poured out the smoking lava in a stream that cut through the garden and pathways and spread to the street where it cooled and paused, waiting until the beam should loose more substance to feed it.

The beam swept on, cutting through the stately trees and the gardens. Cremated blossoms seemed to set forth upon the air all the sweet essence of their perfume an instant before the smoke of their dying rose to help darken the sky.

Ketan watched the fabulous house of Teacher Daran melt like a house of tallow and his gardens and mud fountains turned into boiling pools and shapeless forms. The beam went on and swept the length of the long arc of roadway that passed before the Temple grounds. The plastic substance melted and flowed in a river that piled against the lava mound of congealed Temple substance, paused, then merged and poured on in a mighty stream of fire towards Control Central.

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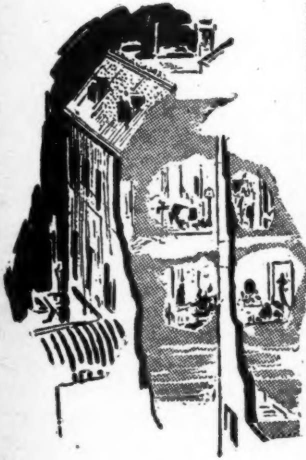

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The destruction was awesome. Its very ferocity and completeness almost stunned Ketan to immobility. He watched the slow, gathering force of the molten river, the curtain of smoke that rose and cut off so much of the light of the sky that it seemed as if both globes had set.

Ketan was roused from contemplation by the voice of the position operator. "The squad is ready."

Swiftly, Ketan spoke and gave them brief, already outlined instructions. Then the operator gathered them into the threshold of a Gate and whisked them across the vast waste of Dark Land and Fire Land into the city. One by one they were dropped into the hysterical mobs that ran through the streets in mad terror. Ketan focused on the thin-faced youngster that was dropped near the *Karildex* ruin. The fellow ran into the hall crying out to the frantic, whimpering Seekers.

"This way!" he shouted. "Run for your lives. The beam is coming this way! Run and hide!"

He ran the full length of the hall crying out at the top of his lungs. Once or twice he paused to shake or slap the face of someone so crazed with fear that he didn't seem to hear the words.

In a few moments he had the occupants of the ruin seething with mob panic and fury. He raced out the remnants of the doorway and they followed blindly not knowing or caring where they were headed, their only impulse being flight. Like the cells of some great animal they had no independent thought of their own and flowed through the streets in a unity of madness and fear.

The young Restorationist called out in a frantic voice to any they passed on the way and the mob grew like a protoplasmic mass that sucked nourishment from all life in its path.

The boy ran straight down the center of the street—into the blustery, windswept snowscape of the hidden valley.

The momentum of their flight overcame the first shocked sight of their surroundings. A cold wind whipping the drifting snow was like a flail against their bodies which were ill-protected by the scanty harness wear worn by most.

They halted and stared and tried to look back. But the Gateway had closed behind them. They turned and their madness focused upon the young Restorationist who stood at a distance before the open door of a building beckoning. Someone uttered an hysterical scream and their unified mob mind sent them rushing towards the doorway in a frenzy.

The scene was repeated then, twenty, fifty times—and only scattered remnants of the most hysterical still raced madly through the streets of Kronweld, or crept whimpering into some unfindable crevice to die.

Hundreds of them had died, Ketan knew, but he was determined to save all that would be saved. He sent the rescue squad back until they were more numerous than the Kronweldians upon the streets. They sought in houses and public buildings for hiding places they had not yet found. They dragged out one by one a score of screaming, terrified Seekers whose minds had shattered before the onslaught.

More than half the city was gone now. Ketan knew that it was time for him to go.

He stepped to the communicator. "Units 11, 12, and 13, and remnants of 9 and 10: Ready yourselves to attack the Statist citadel in force. Formation D, as before."

He turned to Zeeter. "Take command. I'm leaving."

"But where—?"

"I'm taking the big generator—inside."

The officer stared at him. "Not *you*—it's not necessary. There are other drivers, men who have trained long with the big machine. You are needed here."

"There's nothing to be done that you can't do now. I intend to come back, but this is my job. The Director is mine."

He stepped into a marked off square on the floor and signaled the operator. A moment of blackness and meaningless lights, and he found himself upon the turret of the giant generator. Behind him its great bank of controls ranged in almost bewildering array.

For an instant he almost regretted his plan. It was true that many of the drivers were more skilled in the operation of the giant generator, and this was the last resort of the Restorationists.

But the plan was his and no one else could see the full implication of it as he did.

He threw the controls that set the vast atomic power units into operation far beneath the surface of the ground. More by imagination than by sound he heard the whine of their monster rotors.

He turned on the primary energizing current in the loop that arced far overhead and watched it glow into the red with the wasted power of it.

Then the panel flashed the signal from the positioning operator. The assigned Units were in place, their beams flowing ineffectually over the invisible crystal surface that surrounded the citadel.

"Position!" he exclaimed.

Simultaneously, he threw the switches that fed the destroying power into the loops. The red glow died and his vision blacked out an instant. He found himself next in the great valley where he had seen the death of Hameth-Igon. An almost overpowering impulse to get out and search again that valley of ruin and see the ruins of that artificial body came over him:

But the operator called again. "Ready."

The terrible beam of the generator leaped out into space, potential destruction to anything in its path. In that one beam there was the power of ten Units of small mobile generators.

He waited again for the moment of blackness, and it came. He closed his eyes against it, fighting the vertigo that swept over him, and the mental fantasies of worlds and spaces. He swayed on his feet as it ended and opened his eyes.

He didn't comprehend for a moment the thing that he saw. It was too disastrous, too terrifying. But his mind forced itself to consider the phenomenon. He stared at the loop above him.

Its deadly beam had died.

He whirled to the panel behind. The power units were going at full intensity, the converters that turned the atomic energy into lethal radiance were functioning.

But there was no emission from the loops.

Outside the turret lay the Statist stronghold. Beyond, Ketan could see dimly the outlines of the massed generators whose mordant radiation sprayed the invisible sphere that now protected him. He would have been glad to see that sphere collapse if he could be sure the Director would be annihilated at the same time.

The invisible wall held.

Ketan looked back at the building. There was no sign of life or activity. The great, silent bulk of the structure could have held Kronweld's ten thousand and they hardly be noticed within it.

He turned about and switched off the useless, straining atomics and converters. He went down the companionway and through the hatch that led to the outside.

Before emerging, he buckled on a small, powerful atomic unit that fitted over his shoulders. In his hand he grasped the hand weapon that it powered.

A curious sense of instability seized him as he stepped out. It was as if the ground upon which he walked were of uncertain substance and supported him only by the grace of powerful imagination. It seemed to sink and twist like something living as he made his way towards the building.

Outside, beyond the barrier, the world was hidden by the wash of fire. It seemed curiously unreal, too, as if seen through a wall of falling water.

He came to the entrance of the building. The curious stillness was maddening. Even the terrible thunder of the generator beams impinging on substance was absent.

He entered the doorway. The corridor was dimly lighted—and empty. Weapon in hand, he advanced slowly, expecting attack at any moment. He had no recollection from his previous visit of any of the passageways through which he wound. None of the moving passageways was in operation.

He advanced up the sloping corridor and came to the next level. At the far end he saw a door that opened into a large hall. And he saw people within it.

He flattened against the wall and breathed slowly. He had come into the corridor so precipitantly that he knew he must have been seen. But no one moved to approach him.

There was something queer about the figures he could see through the open doorway. Cautiously, with weapon ready, he advanced. Then abruptly he relaxed.

The half dozen or so figures that were visible were sprawled grotesquely where they sat, or upon the floor. They were dead, all of them. He went to the doorway. There were nearly a hundred dead bodies within the room.

They were Statists. The imprint of their culture was upon their faces and in their dress. No sign of the manner of their death was evident.

There was nothing to be learned in that room of the dead and he went on through the corridor peering cautiously into empty rooms and offices and laboratories. Once more he came to a smaller hall and found another group of fifty dead, sprawling Statist bodies.

Then with a start he recognized his location. He knew this corridor. He recognized the closed door just ahead of him. He leveled his weapon with a swift, striking motion and burned the door out of its casement.

"An impetuous young man, but that is what is needed," the voice commented. It came through the air from all about him and prickled the fine hairs upon the back of his neck.

"Director!"

"*The* Director, if you please. Come closer. You need not have ruined my door. Perhaps you have hoped for this opportunity?"

"How I've waited for it," said Ketan. His voice was like a prayer. "I think that I shall be able to demonstrate now that I can kill without qualms."

He raised the weapon point-blank upon the tube that held the Director and advanced.

"Did you forget that I am shielded?" the voice inquired in soft amusement.

"Somewhere I can find a spot that will kill you. Somewhere among these circuits there is power I can cut that will let you die slowly behind your shield."

"As, yes, so there is," the Director sighed as if in infinite weariness. "Let us talk, first, then I shall be extremely glad to remove this shield and let you do as you wish. You are not curious as to who I am?"

"You are the Director. That is all I wish to know."

"I have a friend here whom you might care to meet before you do away with me."

Instinctively, Ketan twisted his head about to scan the walls on either side. At his left a door opened suddenly and through it walked a man.

Ketan's hand almost dropped the weapon. His throat gasped a single word.

"Hameth!"

The trunk-clad figure strode forward with outstretched hand, his bronze body seeming to warm the entire room. But when he neared, Ketan was looking through him.

A second figure had stepped out of the doorway and behind it a third. Each was an exact duplicate of the first. Three Hameths.

"Where—?" Ketan began hoarsely.

The figures were duplicates except in one feature. Each was a dozen years younger in appearance than the previous one.

"Quite good, aren't they?" said the voice of the Director.

Ketan didn't answer. His mind was searching for answers, and the only one he could seize upon was the most incredible of all.

"Do you understand now?" said the voice of the Director. "You saw the wreckage of Hameth under the wheels of your generator.

"I made him. I spoke through him. I influenced you and led the Restorationists through him. Do you understand what that means?"

Ketan's mind was a battleground of conflicting thoughts and emotions, but one incredible reality emerged victorious.

"Igon."

After a time the voice spoke again. "Could you imagine a better hiding place—or a more effective one?"

"I don't understand," Ketan said weakly. "Your extermination of the Illegitimates—the destruction of Kronweld—"

"Was a lot less murderous than it would have been with another in my place. In a thousand ways I have lessened the hardships of the Illegitimates and of the commoners of our cities. I have postponed and prevented the destruction of the Kronweldians.

"Why do you think I allowed

Elta to destroy the Selector? Did you think that the Statists were so ineffective or so foolish that they could not detect and stop her plan if necessary? I had to let her destroy the Selector because you were not ready. The Restorationists were not ready to withstand attack."

"What did you do with her?"

"She is at the pinnacle with her father, Javins, and William Douglas. They are prisoners of Bocknor who is directing the attack against Kronweld."

"Elta—alive!" A stinging moistness came to Ketan's eyes, a blinding film that blotted out the mummied figure in the tube, and a prayer of thanks in his heart.

"How can I get to her?"

"She is safe for the moment. There are many things I must tell you, Ketan. I shall not live much longer. Minutes, perhaps. I have hung on these past months by sheer desire to see my work finished and you in my place."

"How could I ever take your place?" Ketan spoke humbly.

"There are a good many reasons why you should. First of all because my inheritance is in you."

"What do you mean?"

"Your father was my son."

Ketan's face went white. "My father—you can tell me where he is—and mother—"

"No. They were killed in the same blast that made me less than half a man. They were part of our group and they knew what I planned for you before they died."

"I—wish that I had known them. But—" Ketan looked at the shriveled figure. A strange and baffling emotion swept through him. "I have known you. That is a great deal."

"I am glad to hear you say it. I wondered if the common emotions of family relationship would ever touch you. Your mother feared greatly that they would not, but she gave you up."

"Tell me what your plans were. I feel that so much has happened to me which was not of my own volition."

"That is true, but I think you will finally agree that I have denied you nothing that I have not replaced with something better.

"It began with my desire to see one of my own complete the work I had begun. I knew that I would never live long enough to see it through.

"Because I was already in the position of Director, I had the opportunity of examining you at birth and seeing the record of your potentialities. For the most part they were what I needed. I knew that you could be the one to bring back Richard Simons' lost people. Your father and mother finally gave their consent and I sent you through the Selector to spend your first years in Kronweld.

"I knew that you would be automatically selected as I was by the special circuits and impressed to return to Earth. During those years I was the only one who knew who you were. I even kept it from your grandmother, Matra.

"She was furious with me, but I didn't dare let anyone else know your identity. Finally, she discovered you for herself and tried to involve you in plans of her own. I had commissioned her to control the flow of information through the Temple, but Hoult and Daran became too much for her. She determined to do away with them somehow and when she found you she determined that you could help her. She did not know of Elta's gradually changing heart, of course, and included her in that condemnation."

Ketan let his mind drift back to that night when he had been present at the death of the ancient in the Temple of Birth. Something of the strange affinity he had felt for her then came back to him now. He wondered if it were because of her relationship to him. He wished he had known then who she was.

"I watched you all those years," Igon said. "I led you and guided you. I sent special envoys at times to bend you the way I wanted you to go. Branen of the Unregistereds was one. But you must not think I tried to force you into a pattern where you were not using your own initiative. Just the opposite. I merely supplied specific stimuli to bring out the qualities of initiative that were necessary for you to develop."

Ketan thought back to Branen the loyal friend he had known. A thousand little incidents fell into place and were explained where they had been annoying puzzles before.

"So that's why Branen so gently but insistently pushed me on. I could never understand him. He was so self-effacing, but he was like a shadow following me and building up my own ego when I doubted myself. Even in his attempted dissuasion when I was determined to go before the Council I think he was actually goading me on.

"Of course he was," said Igon. "That's what I sent him there to do. There were others of the Restorationists among the Unregistereds who did the same for you. They watched and taught you and reported to me.

"When the time was right for you to go back, I intended that one of the Hameths as Varano should go with you. I didn't want you to dream up some fantastic scheme based on half information as did some of the others who came through. Two of them became so fanatical that I had to kill them. It was the impact of the knowledge that the pinnacle revealed. Their minds were not strong enough to evaluate it properly in spite of the fact that they were brought back through the Selector.

"You did very well in your objective evaluation of the facts you were given. Your weakness was that you underestimated the complexity of the Kronweldians' reactions by standardizing your own, but that was a natural mistake in view of your background. Elta came to a better evaluation there than did you because she had more facts to base her decision on. But she failed utterly until very recently to understand the goal or motive of Richard Simons and his group.

"You got along very well without Varano's help so that it was unnecessary for me to intervene further except to send you back to Kronweld and to the Restorationists."

"I don't understand one thing," said Ketan. "If Varano was merely one of the Hameths, a machine, why did he react to my blow on his jaw, and to the injection I gave him?"

"I had to make him act naturally. To have revealed him then as a machine would have threatened your own self-assertion which had reached a delicate balance at that point. It would have crumbled if you had known the truth."

Ketan gazed upon his grandfather with almost a sense of resentment. "You've pretty well controlled me so far, but we can't remain here talking. A war is being fought and a hundred generators are attacking this building. Our talk must wait."

"There is time," the old man said. "And don't resent what I have done, Ketan. Think a moment and you will understand. You comprehend the ideal of Richard Simons and therefore you know that any measure necessary to carry it out was justified.

"But after growing in Kronweld you were like a plant reared in artificial environment. You had to be taught and your mind prepared very carefully for each step that was to come. I led you to William Douglas who was best qualified to show you the Illegitimates and their conflict. I led you back to Kronweld that you might understand how they would react to the truths you had to tell them. Now you know their reaction and you shall be able to deal with them.

"I haven't tried or desired to control you. I have taught you. This is about the end of it for me. It's yours from here out. This building, as you may have guessed, is removed a trifle from the plane of Earth. That renders your beams inoperative in this space. The dead Statists you may have seen below are some of the leaders I called here for safety when you began your attack. I destroyed them to assist in your task, but there are thousands of others who will still fight and must be overcome.

"The most dangerous of all is Bocknor. If he knows he's defeated, he will attempt to destroy the pinnacle and the gauge and cut you off forever. You could duplicate the gauge setting only in a thousand years of trial and error."

"I must get back!"

"There is time. I want to know before you go: What are your plans? How will you govern?"

"Plans?" They'll have to be your plans, not mine. I had plans, but they were impetuous and ill-thought out. I'll carry out your plan for teaching and orienting the Kronweldians. There'll be chaos for a long time, but with communication and transportation—"

He stopped suddenly as if all his thoughts and all the events that had transpired had led to the abrupt, mountainous barricade of Igon's last question. Elta had asked it, but he hadn't known then what it implied.

"Govern?"

He spoke the word against the backdrop of the scene in his mind. A scene of Earth's millions of ignorant and repressed peoples who would be thrown into an exuberant chaos at their release from the Statist tyranny. They were the hundreds of thousands of barbarous, impulsive Illegitimates. And Kronweld's handful of dazed and bewildered and shocked Seekers. He understood then what Elta had meant.

He shut the scene out of his mind and closed his senses to the complexity of the problem before it blinded him to its simplicities.

"We won't try to govern them," he said at last. "We'll let them govern themselves. That's the way that's always been best. That's the way it's got to be. We won't govern; we'll teach. For a while we shall have to administer, but we'll give it over to them in the end.

"And we'll give them the *Karildex*. That will be our gift to them, and in the end it may prove to be the one thing that will bring about the realization of Richard Simons' dream. All the old governments failed when their attempts at representative rule collapsed because of their complexities and the patent impossibilities inherent in the idea of a billion people sitting down together and making their own laws.

"The *Karildex* removes all those impossibilities. The desires and wishes of the most remote member of such a society will not be overlooked in lawmaking with the use of the *Karildex*. I wonder why the old civilization never saw that it would take a machine to make their government function as they desired?"

"I wondered if you'd see it," said Igon solemnly. "The whole contribution of Kronweld to civilization consists of the *Karildex* and your means of government. It is justification enough for Richard Simons' entire experiment. He proved that minds of the type he selected could not concern themselves with the pettiness of government by politics; they removed the problem as quickly as possible and set up a means of control that was almost automatic in its function.

"The weakness of Kronweld, that almost succeeded in destroying it, was a common weakness of man, susceptibility to superstition. Superstition's only remedy is knowledge. You tried to give them that. Sometimes education has to be administered violently as is now being done. There was no other way. Kronweld was slowly rotting from its intellectual inbreeding. It had passed its apex of civilization.

"There is one thing above all that you must teach the people. Teach them to build and use and revere machines. The machine is the mark that sets man apart from the animals. It is the expression of his intelligence, but intelligence without expression is only a vapor. In the Second Dark Age man became afraid of the machine and vowed to live without it and so he became no more than the beasts, unable to travel faster than his legs would allow, or to speak any farther than the sound of his voice would carry.

"Teach the people to build and dream of greater and greater machines until they can reach the stars. The machine is man's poetry and his music and all his art. Never forget that fact.

"Never make the mistake the antimaterialists made."

"I won't," Ketan promised solemnly.

After a time he said, "What of us, now? You are coming back with me. You must speak to the Kronweldians, tell them of your work."

"No . . . no, they must look to you. I shall remain a legend as the great iconoclast of Kronweld. I'll send you back now, to the pinnacle. I'll return your machine to the valley in Dark Land. You must go to the pinnacle and deal with Bocknor. Then after you are gone I shall go on a little further. There is a plane where death is very quick and quite sweet.

"Good-bye Ketan, son of my son."

XXIX.

With the words still in his ears, blackness covered his vision and Ketan was alone in his disembodiment, soaring through space and time. There was only one conscious thought in that epoch of transversal. The image of that half human figure of Igon, the knowledge that he had found a living ancestor.

PIPELINE TO TROUBLE

It was an old-time feud between the Colbecks and Morgans in the Ozark Mountain country. . . .

It made the Hatfield-McCoy feud look pretty small-time. Because this feud led to grand larceny, murder and sabotage. . . .

The only man who could straighten things out—at least he thought he could—was Doc Savage. See what happens to him in SATAN BLACK in the November issue of

DOC SAVAGE

AT ALL NEWSSTANDS

He thought for a time that he was in the forest of Kyab where he had first awakened. There were trees rocking slowly against the distant sky and clouds floating at their tips.

He sat up sharply trying to think. This was not the same. Deep beds of flowers covered the earth and almost overpowered the senses with their perfume. Then he heard a voice.

"We have been waiting for you. Igon said you would come."

He jerked his head about and looked up. It was Dorien, the First Woman.

"Where is she?" he demanded almost harshly. "Where is Elta?"

"Elta is safe. She is imprisoned with her father and William Douglas. There are other Statists here, but Igon told us to wait until you came before destroying them."

"Igon is dead."

"I know. He said that you would take his place and we should work with you."

"Can you destroy the Statists?"

"We prepared ourselves to prevent the entry of any unauthorized persons. We have allowed these to come, but we can take care of them."

"Then I'll help—"

"There is nothing you can do. Watch."

The image of the girl passed gracefully between the trees and through the flowers, her dark hair like some exquisite blossom moving with the gentle breeze.

Then Ketan saw the man through the trees in the far distance. He was a Statist, armed and arrogant.

Ketan rose to follow Dorien. He should have asked her the way to Bocknor. Somewhere within the pinnacle the Statist was guiding the attack upon Kronweld. Fear was high within Ketan over the outcome of the battle. Igon had seemed so calm as if it were already decided, but Ketan knew the Restorationists could yet lose, miserably and calamitously. He wondered if the attack upon the valley had begun, or if Bocknor had not been able to locate it.

Screening himself in the forest, he tried to catch Dorien, but he could not even keep pace. Then he saw her close to the distant Statist. The man had lowered his weapon and was putting his arms around her. Ketan stared uncomprehendingly.

At that moment a tremendous flame of light blinded him. Its fire and the blast of it flung him backwards. He threw an arm before his eyes to blot it out. When he could at last see again, Dorien was returning and the Statist was nowhere to be seen.

Then he understood what had happened, and a cold, trembling wave went through him at the thought of what might have happened if they had not properly identified him when he fell through the excavation into the pinnacle the first time. The power that was dormant in those images—

"Take me to Bocknor—and Elta," he said.

"You must be careful. There are many Statists—"

They went up the familiar trail and broke into the marble hall. A Statist was waiting for them there.

He raised his weapon instantly towards Ketan. Ketan's own was leveled, but he was slower. The Statist pressed the trigger and a blossom of fire burst into the air.

Dorien caught it. She leaped in front of Ketan as his own weapon sprayed her back with a cloak of livid radiance. But she was still running with outstretched arms towards the gasping, staring Statist.

The man fired again and again, and the beams sprayed over her figure in an aura of terrible light. Then she was upon him, her arms clinging tightly about him.

Ketan whirled and buried his face against his arms, but the radiance she unleashed penetrated the blackness as if through his very flesh.

He turned back. She was walking towards him with a smile on her lips.

They wound upwards through the pinnacle's passageways. No more Statists were in evidence, but they kept a sharp watch for any such. When they reached the end, Ketan realized all his care was worth little beside the probably automatic detection which told Dorien of the presence of anyone near.

They came to a high vaulted entrance blocked by a closed door.

Dorien hesitated. "My power will be dangerous to the others if I use it full strength in there."

"Wait until I ask it then," said Ketan. "I don't think it will be necessary."

He opened the door.

The scene before Ketan was like a collection of wax images.

Two Statist operators whirled from their panels on his left. Ahead of him, the corpulent Bocknor stood openmouthed. Beyond, in a small alcove, Elta and Javins and William Douglas were bound upright against the wall.

Bocknor's hand was on his weapon. "How did you get in here?"

"I come from the Director. He can't get through to you. He wants to know what is wrong."

"There's nothing wrong here! This is a trick. I'll—"

"Why don't you call the Director, first?"

"Call him!" Bocknor ordered an operator. Then to Ketan. "I don't know how you found us here except by guess, but all the tricks in the world won't do you Kronweldians any good now. Look at your city. How do you like it?"

He swung a hand towards the screen where the burning city could be seen. It was almost entirely gone now. Only a molten lake was recognizable as far out as the farming lands.

At that moment, Elta caught sight of Ketan for the first time and her voice rang out with recognition. "Ketan!"

She could not see Bocknor. Ketan struggled with all his power to keep from answering her cry, but he kept his eyes on Bocknor.

The operator was having trouble with the equipment. Ketan supposed he was not completely familiar with it yet. He finally got the scene—the scene where the Statist citadel had stood. There was only a hemispherical depression in the ground, as deep as the building had been high.

Bocknor gasped and swore. His mental reflexes functioned slowly and only succeeded in bringing contortions to his fat countenance. His alertness vanished and Ketan leaped.

He seized Bocknor's gun arm and twisted with all his strength. It took every erg of it to force the thick, short arm around and break the wrist hold on the weapon. Like many fat men, Bocknor was deceptively muscled.

The gun dropped to the floor and spun away from them. Ketan kept on twisting, then suddenly flung his entire weight to one side. Bocknor slammed to the floor.

Ketan's foot struck a smooth spot as they fell and he landed on his back almost beside the Statist leader.

The two operators had risen from their feet and one of them jumped. He landed on Ketan's outstretched wrist. Through the sudden pain waves Ketan saw the other foot raised to smash into his face. He waited until the foot was in the air and jerked aside.

Bocknor lay heavily, struggling for breath that had been knocked out by his fall. As the operator's foot landed in the space where Ketan's head had been, Ketan grabbed his leg and twisted, rising at the same time. The men fell headlong, his other knee plunging into Bocknor's midriff.

The second operator had picked up the gun by now and waited calmly as Ketan arose. He pointed the weapon directly at Ketan's back. Sensing, rather than seeing it, Ketan whirled. But he was too late. The finger was already despressing the button.

At that moment Dorien came up behind the Statist. She did not approach too closely or reach out to touch him. She stood behind him as if trying to gauge her distance carefully. Her figure became inclosed in a halo of golden light.

That halo touched the Statist operator. The smell of burned flesh filled the air, and his back arced as if he had been struck. He crumpled to the floor.

The other operator had witnessed the scene. He had risen to one knee and remained petrified with terror for Dorien had not stopped. The golden glow still surrounded her and she was advancing towards him.

He gave a fearsome scream as he backed into the corner.

"No!" Ketan cried. "I can take care of these two. I want—"

But Dorien's hand had touched the man. His long scream of pain echoed in the chamber and then his blackened corpse collapsed.

Bocknor cringed against the floor. Dorien was looking down at him. "They have despoiled our repository," she said. Her voice was bitter.

"Give me this one," Ketan demanded. "He has done worse to Kronweld. He has changed it to his own pattern. He should live there!"

"Do as you wish." The golden halo died.

Bocknor was rising to his feet, shaking with fear and swinging his fists. But there was no danger left in him. He sagged as Ketan plunged a fist into his face.

He was half conscious, but Ketan dragged him to a point in the center of the floor. Then, after examining the control panel a moment, he adjusted a couple of controls. Instantly, a section of the hell-world of Kronweld opened beside him. He adjusted it to the edge of Fire Land where the beam spewing out of the Edge had not yet touched. He pressed a button. Bocknor was no longer in the room. He was lying on the radioactive sands at the border of Fire Land.

Ketan closed the scene and went into the alcove. Swiftly, he cut the bonds from the three prisoners. His arms went about Elta and tears flooded over the ledges of her eyelids. Ketan felt their wetness upon his own face.

Javins and William Douglas greeted him warmly.

"We didn't know whether we were ever going to see you again or not," said William Douglas. "We thought Bocknor had come out on top for sure."

"Not while Igon was running things," Ketan smiled. "He never lost control."

"He's gone?" asked Javins.

Ketan nodded.

"Igon was the Director?" Elta asked unsteadily. "I don't understand—"

"There is a lot to tell you yet, but we haven't won the fight. I've got to call Zeeter."

He returned to the chamber and called the Operations Center and the commander.

"Ketan," the old leader acknowledged. "We thought you were gone."

"Never mind. Tell me how it stands."

"Kronweld's gone. I suppose you know. But that isn't all. The Edge is breaking down and Fire Land is erupting like never before. It looks as if the whole land is breaking up!"

"Just a minute. Let me look. I'll contact you again."

Ketan swung the view away from the Center and swept it back towards Kronweld.

Outside the valley the view swept along the snow-covered peaks and valleys and down to the barren plains. Ketan suppressed an exclamation. Vast chasms were opening in the ground, great cracks that stretched for endless distances across the bleak plain. As he swept along he saw a herd of Bors running madly from the thunderous opening of the ground. A chasm suddenly burst open before them and they plunged on, screaming and bellowing, into the depths.

Further on, a great storm lashed the sky and sent bursts of lightning against the plain. Spouts of smoke and flame were opening up far from the boundaries of Fire Land.

He sped on to Fire Land itself. The great molten lake he had crossed with Varano was a seething inferno, hurling waves of lava far beyond its shores. A new volcano threw puffs at the sky, puffs that contained chunks of half solid rock as big as a building.

Flames of radioactive radiation darted across the length and breadth of the Land. The death fire of incalculable numbers of atoms scintillated in a continuous auroral glow that leaped and touched the sky and flung itself back to the rocks and fires, only to burst forth again in a mad, unending oscillation.

Ketan felt moisture upon his brow and rivulets of it running down his face as he watched the dying world.

"The entire land is breaking up," Elta said sadly. "The radiations of the generators and projectors must have set it off."

Ketan brought the view still farther back until he was at the boundary where Fire Land met the Edge. The sight that met his eyes almost forced him to look away from the awful terror and sheer beauty of it.

The very Edge itself seemed to be aflame.

A curtain of fire reached to infinity above and beyond on either side of Kronweld. The thing was like an infinite falls of flaming liquid. The flames rippled through the spectrum from violet and blue through the scale into deep and terrible reds that tumbled and sped ever downward into the lake of lava below.

In a moment of infinite regret, Ketan knew that now he would never understand the secrets of the Edge.

He turned away and cried out to the Illegitimate. "William Douglas! We've got to bring them here. Can the Illegitimates take care of them?"

"You mean all of the valley—?"

"Take them to Danfer," Javins burst in. "They can't go to the primitive villages of the Illegitimates."

Ketan pressed his lips in a thin line. "There are nearly twenty thousand of them. We'll bring the Restorationists to the city. You will direct their resettlement, Javins. The Kronweldians we will send to the villages. Are they capable of taking care of so many?"

William Douglas nodded. "Almost. I had nearly completed my work of organization. I wonder if Igon anticipated—"

"You will direct their resettlement there, then. I'll get some position operators from the valley and you can use one panel to communicate with the separate villages."

"Why not the city?" Javins pleaded.

"This is better," Ketan said. But in his mind he was thinking of that first day when he walked along the streets of the village among the Illegitimates. He was thinking of those firm, defiant faces and the inspiration that had been upon him then— if only they could mingle with Kronweld and learn and teach with them.

There would be conflict, he knew. But out of it would come understanding and the leaders who must assist him. The Illegitimate vil-

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lages would become cities and the cities would become the nuclei of the new civilization.

In time, when they had learned of their heritage and the new world, the Kronweldians would slowly filter up to their places at the top, but it would be after they had earned it.

Ketan went back to Zeeter. "We will transfer everyone as rapidly as possible. Gather the Kronweldians a hundred in a group and we will bring them through. We will control their positioning from here. At the same time you send the Restorationists, as many as possible at a time, to Danfer. Abandon everything. There is no time to transfer anything but the population."

Zeeter looked stunned for an instant as if unable to comprehend the magnitude of the catastrophe, then he spoke crisply and firmly. "I'll give the orders."

Technicians came from the valley and swarmed through the pinnacle. Those who were there for the first time stifled their amazement and curiosity and worked in a frenzy under the direction of Richard Simons and Dorien and Ketan.

From the vast stock of machines and materials in the pinnacle they produced a mesh to protect the entire rock for there were yet three and possibly four Statist projectors at large. There would be no safety until they were hunted down and destroyed. Under the command of Zeeter, the generators that had been in Danfer were stationed in protective formation, ready to attack the moment one of the enemy machines should appear.

There were many hundreds of Statists yet to be accounted for. The emergency police guard of the Restorationists was given the task of seeking them out and eliminating their menace.

Standing behind the position operators, Ketan and Elta watched the swift transfer of the Kronweldians to the villages. Nearly a thousand trained administrators from the Restorationists were assisting in the gigantic task and William Douglas was capably directing the entire operation.

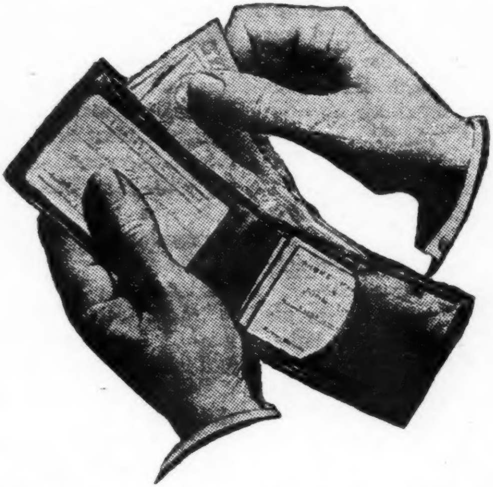
"There's some of the Council," said Ketan. "It's Anot and Nabah. I wonder what they think now of their tight little world where they knew almost everything there was to know?"

"It's the end for them," said Elta slowly. "Their world has shattered and they have died with it. Such minds as theirs would have become closed and dogmatic in any environment. But only a few in Kronweld were as intractable as they. With the wiping out of superstitions, new knowledge will flood into most of the minds and you will have the leaders and teachers of which Richard Simons dreamed. I see it now."

"Igon told me you had gained an understanding. I hoped it was true."

By the time the last group was transferred the entire world of Kronweld was a mass of flame from the Edge to the valley of the Restorationists. Flames burst out of the ground and engulfed the great

How to prevent inflation in one easy lesson



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HELP US KEEP PRICES DOWN

A United States War message prepared by the War Advertising Council; approved by the Office of War Information; and contributed by this magazine in cooperation with the Magazine Publishers of America.

Operations Center. Its needle spire tipped crazily and hung a moment in the sky as if reluctant to give up its commanding position. Then it crashed and lava sucked it into itself with molten, savage lips.

Ketan turned off the scene and closed the Gateway. He went behind the panel for a moment and shifted the setting of the gauge.

He stole a moment then with Elta and they went down into the eternal gardens of the pinnacle where soft clouds like balls of white cotton were brushing the sky.

Conscience-guilty, Ketan knew that he must not remain here, that the task of the Restoration had only begun, but just for a moment—

Elta turned her face up to his and he saw worry and fear lining her brow. "What—"

"Ketan, why did you have to rebel at wearing the day cloak in Kronweld? Oh, why couldn't you have conformed in just one thing?"

He smiled. "That was when I first went to the House of Wisdom. I had to have *something* to rebel about, but I never did go without it for long. It was too uncomfortable."

Elta's eyes shone suddenly as if a burst of sunlight had fallen upon her face. "You mean there is a chance for us then, like the rest of them?"

Ketan's mind went back to that night in a dark cave in the Kyab and he thought of Mary and William Douglas. "I'm sure there is," he said, "if that's what you want." A tremor went through him and all the old fears and tight, mind-inclosing walls came back.

It was the unnatural man of Kronweld that Hameth—or Igon—had warned him against and Ketan tried to shake him off.

"More than anything else in the world," Elta said. She drew close and laid her head against his shoulder. "I want it more than anything else."

Ketan turned her face up to his and his eyes responded to the glow in hers.

"I'm sure you'll get what you want," he said. "I'm very sure of it."

THE END.

* * * * * * * * *

Sorry—We all make mistakes! Willy Ley's Viking Press book "Rockets" is $3.50 a copy. Bob Heinlein slipped in his review to that extent. But then, the rest of the review was an understatement too!

J. W. C. Jr.

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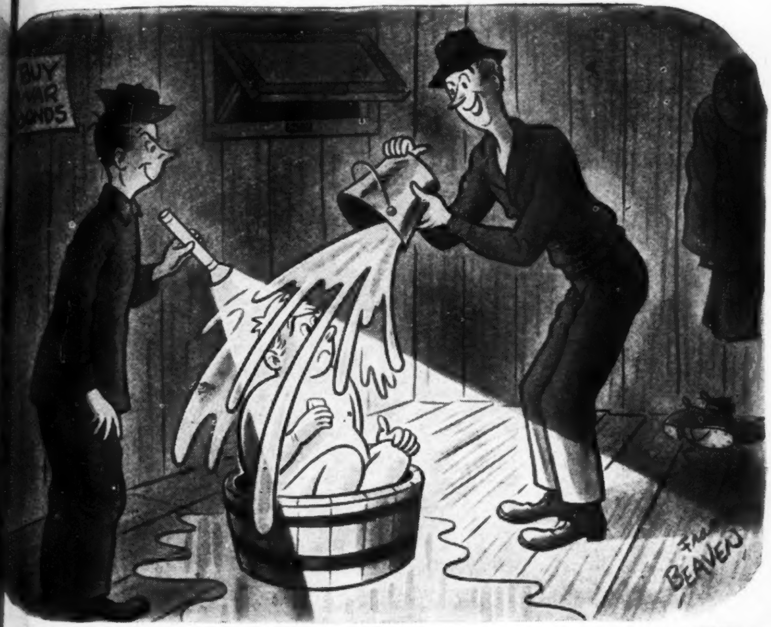
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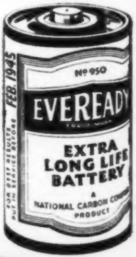
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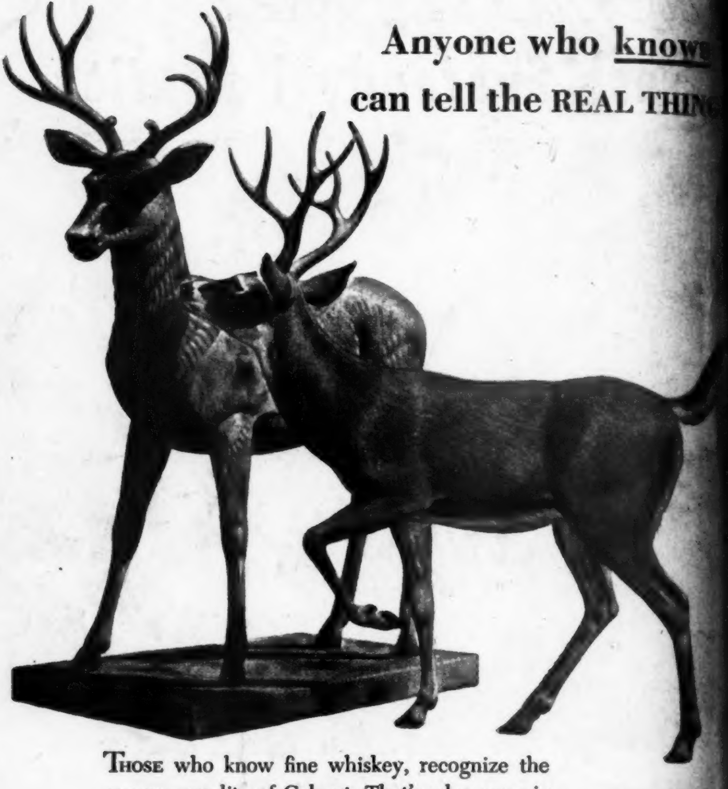

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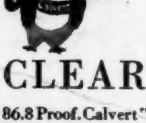

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